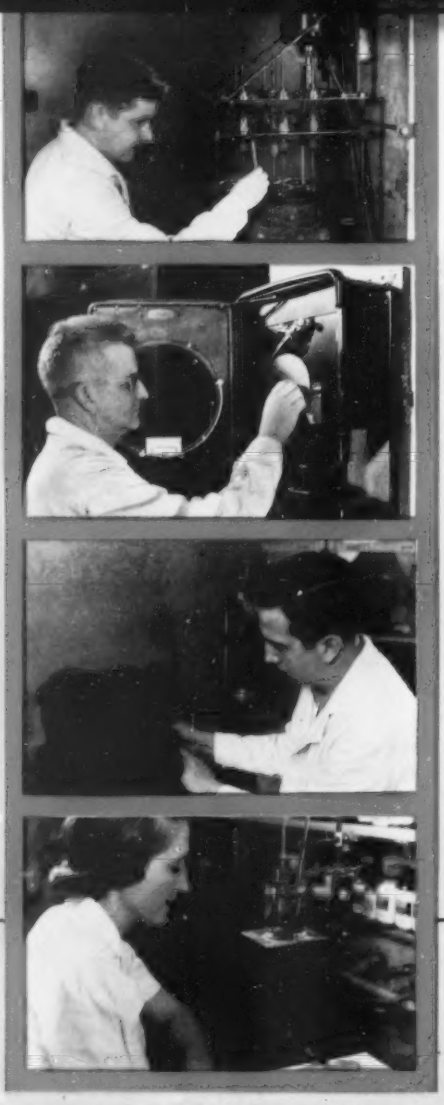
AUGUST • 1954

NLGI Spokesman

Journal of National Lubricating Grease Institute

Experimental grease-making machines
Cam-activated sequence controls for grease-cooling chambers
Grease worker and penetrometers
Dropping point tests



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President's page

by G. A. OLSEN, President, N L G I

BUSINESS DEMOCRACY IN ACTION

The immediate past President of the National Lubricating Grease Institute represented one of the largest manufacturers of lubricating grease in the world and also one of the largest units of the petroleum industry. This year, the President of your Institute represents a very minor segment of the industry which plays a correspondingly small role in the manufacture of lubricating greases. This change in leadership from a representative of a large to a small company exemplifies American business democracy in action which, over the years, has been one of the major contributing factors to the successful operation of the National Lubricating Grease Institute since its inception over twenty years ago.

Large and Small, They All Benefit

During this time, the Institute has devoted much of its energies towards the dissemination of information, with reference to the proper application of lubricating greases and the development of the NLGI nomenclature, it is gratifying to note, has become standard for lubricating greases the world over. The members of the Institute have also profited from the wide range of information gathered at annual sessions, where problems of industry have been discussed by representatives of manufacturers, both large and small, with encouragement given and challenges issued for the improvement of lubricating techniques and product values.

Sincerity of Purpose

Comments were made to the writer at last year's meeting by those who had not attended previous sessions of the Institute, to the effect that they had never previously experienced the same sincerity of purpose and attentiveness at any similar meetings and emphasized that they had not before observed the same spirit of cooperation by both large and small segments of any other section of the oil industry, or any other industry, as exemplified by the National Lubricating Grease Institue.

The program arranged for this year's meeting promises to be well worth the attendance of everyone interested in the manufacture, sale, or application of lubricating greases.

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ABOUT THE COVER

For the first time we have illustrated a marketing article "After the Sale." You'll see it in our new Marketing Section beginning on page twenty. It's a novel slant on a subject everyone is talking about.

Since much of the article is directed toward the storage of lubricating grease, artist, Ronald Jones, illustrated the stacking of the new 120 pound drum. He selected this subject because he said he didn't know much about the sale of lubricating grease. We assured him that he had plenty of company.

Valeria Elersich, pre-doctoral student at the University of Southern California and holder of the National Lubricating Grease Institute fellowship in the SC Department of Chemistry, operates microtome with Richard F. Baker, Ph.D., head of the electron microscope department, and associate professor of experimental medicine at SC.

GREASE STRUCTURES

. . . Indicated by X-Ray Orientation Analysis and Electron Microscopy

MARJORIE J. VOLD*
VALERIA A. ELERSICH†
RICHARD F. BAKER
ROBERT D. VOLD

University of Southern California

SUMMARY

The present work was undertaken at the University with the hope of developing a method of preparing specimens without breaking down the arrangement of the solid particles as it occurs in the grease. It is believed that a study of this secondary structure may show differences or similarities among various greases which are not apparent from the smears or suspensions. Two different approaches have been taken, and both have yielded interesting and promising results in the preliminary experiments. One employs an X-ray diffraction technique; the other, the electron microscope.

The X-ray diffraction technique is employed to measure the degree of orientation of solid particles in a grease subjected to flow. The hypothesis here is that if solid particles in a grease are arranged in a loosely-formed, random piling, they may be expected to line up fairly regularly in the direction of flow, upon application of a directional stress. On the other hand, if the grease is composed of a rigid, integrated structure,it may be expected to resist mild attempts to orient its particles. In this latter case, then, X-ray orientation analysis would show the particles to be evenly distributed in all planes.

The second approach consists of electron microscope studies of very thin sections, about 0.1 micron thick, prepared by freezing and slicing samples of commercial greases from which the base oils have been extracted and replaced with cetane. Greases containing their original base oils will not freeze sufficiently at convenient temperatures to permit satisfactory slicing. Extraction of the oil with cetane does not alter the original dimensions of the grease samples and is not expected to disturb the grease structure significantly. The cetane-extracted grease is easily frozen at dry ice temperatures, and regular, thin sections are obtained by slicing with a modified micro-

*The X-ray diffraction work here reported was conducted under contract No. DA-04-495-Ord-303 between the Office of Ordnance Research and the University of Southern California under the direction of M. J. Vold.

†National Lubricating Grease Institute Fellow

tome. By being sliced while in a rigid, frozen state, the specimen is subjected to less violent distortion than in the smear or suspension techniques. Future studies will establish whether any disturbance of structure results from the extraction, freezing, or slicing operations.

Aluminum, lithium, calcium, sodium, and barium soap greases have been included in the present study. Conclusions drawn from the electron microscope observations agree with explanations based on the X-ray orientation analyses. An aluminum base grease is found to be composed of amorphous masses of tiny, unresolved particles, without any large scale oriented soap structure. A grease containing 6 per cent lithium 12-hydroxy stearate shows the highest degree of orientation, with fibers being joined or superposed at distances of 0.5 to 1 micron. A grease containing 16.5 per cent calcium tallow soap shows a considerable amount of coherent structure in which very fine fibers exist along with broader fibril bundles. A sodium base grease is composed of elongated ribbons many microns in length, showing little tendency to intertwine or twist into the rope-like structures of the lithium and calcium soaps. A barium tallow soap grease stabilized with low molecular barium salts produces sections of matted, broad bands of fiber bundles of such great density that it is difficult to detect whether or not any integrated structure exists.

INTRODUCTION

VALERIE A. ELERSICH

The glamour of grease chemistry is usually not properly appreciated by the general public. Thus I was quite unprepared for the reaction of a friend, who is a newcomer to the United States, when I announced to her that I was preparing to talk about grease. She looked at me admiringly, and in my mind's eye I stood an inch taller as I glowed with pride. Then she went on to say that her brother had reached a similar high level of education—he, too, had studied Latin and Greece!

For me, the chemistry of greases has taken on a great deal of glamour since I began work in June, 1953 under the NLGI fellowship at the University of Southern California. This fellowship was established by the Institute three years ago to further basic research on grease structure.

Sometimes it is difficult to see the practical value of fundamental research. How will it help you sell grease if you learn that the length of calcium stearate fibers is 5-10 microns? How can grease processing be improved if we learn the nature of the interaction between the solid particles of a grease? One purpose of such basic experiments is to establish whether the rigidity and stability of grease structures are related to the dimensions of the solid particles, or to the forces acting at the points where these particles are in contact with one another, or to other factors. Once the critical factors required to produce desirable gel characteristics have been determined, grease manufacturers will be better able to select additives or processing variables which will result in improved commercial products. If we do not understand the mechanisms by which stable grease systems are formed, improvement must continue to depend on trial and error or accidental discovery.

Much fine progress has been made in research laboratories throughout the country on the study of the individual particles which form the solid phase of a grease. Electron micrographs such as shown by other speakers at this meeting show a variety of twisted fibers, ribbons, platelets, and other shapes and forms. Measurements of the dimensions, and ratios between the dimensions, of these particles show that these properties correlate with consistency and mechanical stability of the finished greases.

Less progress has been made in determining how these fibers and ribbons intertwine or grow together to form a continuous network. Such a continuous network must be assumed to exist in order to account for the rigidity of a grease system. One reason that this study has lagged behind is that samples suitable for viewing in the electron microscope are so difficult to prepare.

A grease cannot be viewed directly in the electron microscope because the oil obstructs the view of the underlying structure, resulting in a nebulous, indefinite image. Therefore, two techniques are generally used in preparing specimens—both involve elimination of the oil. In one procedure, a small amount of grease is "smeared" into a very thin film which is then washed in a light hydrocarbon solvent to remove the oil and to permit a clearer image of the solid skeleton to be produced in the electron microscope. In the "suspension" technique, a minute quantity of the grease is shaken vigorously with a light hydrocarbon, and a drop of this dispersion is placed on the screen for viewing in the microscope.

Both of these methods produce fine specimens for studying the *separate* solid particles, but both suffer from the disadvantage that they may be destroying whatever *continuous* structure existed in the original grease.

REPORT

THIS PAPER reports progress in the attempt to elucidate the mechanism by which dispersed soap confers grease properties upon hydrocarbon fluids. Part of the data consists of electron microscopy of thin sections and part of X-ray orientation analysis. Both techniques have been described previously in *The NLGI Spokesman*.[1, 2] Further developments, on which this paper is based, are available in report form.[2, 6]

The approach consists in examining the morphology of the dispersions of soap crystallites in oil without, as yet, inquiring into the factors controlling it. Attention is focussed primarily on the question of whether the size and shape distribution of dispersed particles is the principal determinant of grease properties or whether, in addition, coherent aggregated structures exist and contribute to the observed macroscopic behavior.

Pictured above are authors Dr. Robert D. Vold, head of the chemistry department at the University of Southern California, and his wife, Dr. Marjorie J. Vold, university chemist.

The results of a survey of a selection of commercial greases by the two techniques suggest that the relative importance of ultimate particles and particle aggregate structure varies widely from grease to grease.

X-Ray Orientation Analysis

Individual crystallites of many soaps tend to take the shape of more or less flexible laths (or ribbons) in which the 001 planes form the largest surface. The intensity of X-rays diffracted from these planes, after correction for absorption of X-rays by the sample and for soap concentration in the grease, measures the volume fraction of soap whose crystallites have a particular orientation with respect to the bulk grease specimen. By varying the disposition of the specimen to the beam, the distribution of orientations may be obtained.

When a powdered soap is compacted, the flat surfaces of the laths tend to set themselves perpendicular to the direction of compaction. When a dispersion of soap particles is sheared, the laths tend to set themselves parallel to the flow lines. The experimental arrangements are such that for examination of either a soap powder or a grease these preferred positions result in the long axis of the laths or ribbons lying parallel to the flat surface of the specimen which is contained in a shallow cylindrical cup.

The sample cup is mounted so that its flat surface is inclined to the incident X-ray beam at the Bragg angle for the particular 001 reflection used. The sample surface can also be rotated about the direction of the incident beam so as to bring into reflecting position laths turned at varying angles ϕ about their own long axes parallel to the specimen surface. The total intensity observed, integrated over all accessible values of ϕ, measures the volume fraction of soap whose lath or ribbon-like crystallites or fibers lie parallel to the surface. The ratio of this volume fraction to the volume fraction that would have this orientation in a random sample is represented by the symbol E. In many cases, a truly randomly oriented sample was never achieved for comparison, however, and only numbers proportional to E, given as E/k, can be reported.

The curve of corrected intensity $(F(\phi)/k)$ versus ϕ measures the extent of twisting of the laths or ribbons about their long axis. The preferred position is at $\phi=0$ (laths flat on the surface), so that most of the experimental curves have a more or less sharp maximum at this point. The ratio of the corrected intensity at the maximum to the mean $(F(0)/E)$ is a measure of the steepness of the maximum and thus inversely of the extent of twisting of the soap fibers. $F(0)/E=1$ corresponds to random rotation or twisting about the fiber or lath axis. Values of $F(0)/E$ as high as about 2.5 have been observed. This corresponds to 2.5 times as many flat-lying laths as would be expected on a purely random basis.

Figure 1 shows schematically the geometrical relations involved in orientation analysis which, in summary, are (1) for the spectrometer used, diffraction is observed only from crystallites whose lath or ribbon axis is parallel to the sample surface and (2) of these, diffraction is observed at varying angles of tip of the surface according to the twist or rotation of the fibers about their long axes. A degree of approximation is involved in this interpretation of the X-ray data which, together with the precise manner of correcting the observed intensities for absorption, etc., is discussed in detail elsewhere.[6]

Orientation Experiments on Greases

Values are given in Table 1 of $E(\phi)$ for compacted powdered lithium stearate and for mechanical dispersions of the same soap powder in cetane prepared for

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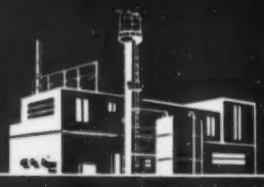

orientation analysis by pressing out a small amount of the paste into a layer 0.3 mm. to 0.5 mm. thick. The flow is radially outward from the center of the sample surface, to which the flow lines are parallel. The curves all exhibit a maximum at $\phi=0$ (crystallites preferentially flat on the surface).

The ratio F (0) to E is also included in Table 1 as a measure of the extent of the curvature or preference to perfect orientation.

TABLE 1

E Values for Powdered Lithium Stearate and Mechanical Pastes in Cetane

Sample	*E*	*F(0)/E*
Powder No. 1	14.2	1.76
Powder No. 2	9.8	1.63
40% paste of No. 1	10.7	2.4
15% paste of No. 2*	8.0	2.14
30% paste of No. 2*	11.1	2.06

* Cetane exuded from these dilute pastes during flow, and was taken up with filter paper and weighed to enable appropriate corrections for the actual soap concentration in the specimens X-rayed.

The numbers thus have the following significance: For powder No. 1, for example, 14.2 times as many soap fibers on a volume basis are parallel to the surface as would be expected in random packing, while of these 1.76 times as many lie perfectly flat as would be expected if all those parallel to the surface were uniformly rotated or twisted about the fiber axis.

The conclusion drawn from this data is that despite the differences in procedure required to obtain oriented specimens of paste and powder, samples for which the oily system is truly a mechanical dispersion without coherent structure yield orientation distributions comparable to those of the compacted powder. Therefore, the degree to which orientation data on commercial greases diverge from orientation data for the compacted powdered soaps obtained from them by liquid phase extraction at moderate temperatures (not over 70°C., using Skellysolve B) is taken as a measure of the extent to which the soap particles build coherent structures in the grease capable of resisting orientation of the ultimate crystallites or fibers by shearing stress.

The extracted soap powders presumably consist of aggregates of the same ultimate particles as are present in the initial grease because the solubility of the soap in either the oil or Skellysolve B is so low that little opportunity exists for recrystallization. An attempt was made to prepare randomly oriented samples of the same soaps by quenching them (in ice water) from melts since the quantities available were inadequate for exhaustive grinding. Although this attempt failed, results of orientation analysis on the powdered fused soaps provide an interesting comparison with the results for the powdered extracted soaps.

Experimental Results. Curves of $F(\Phi)/k$ for three greases and for the soaps extracted from them, and for the same soaps after fusion and powdering are given in Figure 2. Data for two additional greases which do not lend themselves to graphical representation are presented in Tables 2 and 3.

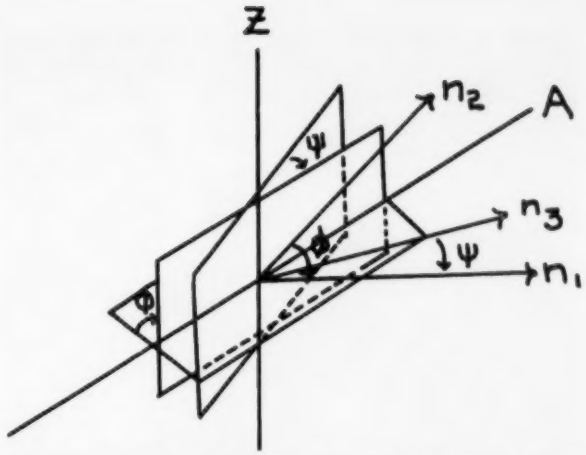

Figure 1—*Geometrical Relations in Orientation Analysis.* Crystallites must have their normals n in the direction n_1 in order for diffraction to be observed in the Norelco Spectrometer used. n_2 can be brought to that position by rotation through the angle θ about the axis A which lies in the plane of the specimen surface parallel to the spectrometer plane. n_3 cannot be made coincident with n_1 except by rotation about the z axis, which cannot be readily accomplished with the spectrometer.

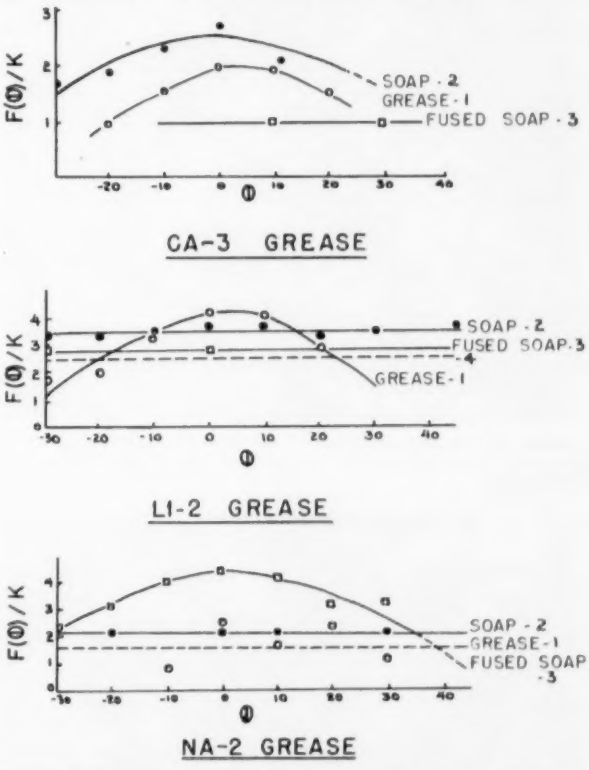

Figure 2—*Distribution of Orientations in Some Commercial Greases, and in Soaps Extracted from Them Before and After Quenching from Elevated Temperatures.*

1. ○, grease. 2. •, extracted soap. 3. □, extracted soap after thermal treatment. 4. (for Li-2 grease), mean value of $F(\theta)k$ for the grease; it is interesting that this is below that of the extracted soap by a substantial factor.

Grease Ca-3 contains 10% of a calcium soap of mixed fatty acids approximating calcium tallowate. Grease Li-2 contains 14% tech. lithium palmitate. Grease Na-2 contains 16% of a sodium soap of mixed fatty acids (50% HP, 40% HStr, 10% HOl). All are manufacturers' samples and little information is available on the oil base.

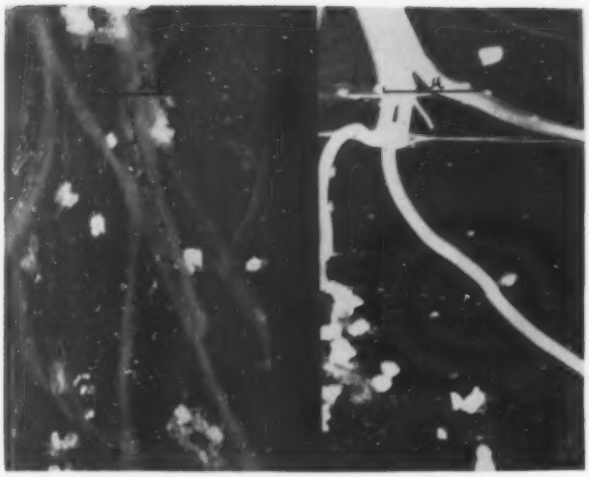

Figure 3—Ba-3 Grease. *Left*—Hexane-leached smear. *Right*—Outlying field of section of cetane-extracted grease.

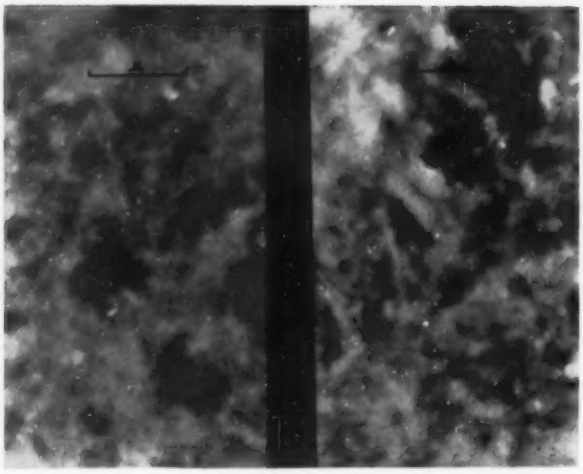

Figure 4—Al-3 Grease. *Left*—Suspension of cetane-extracted grease. *Right*—Section of cetane-extracted grease.

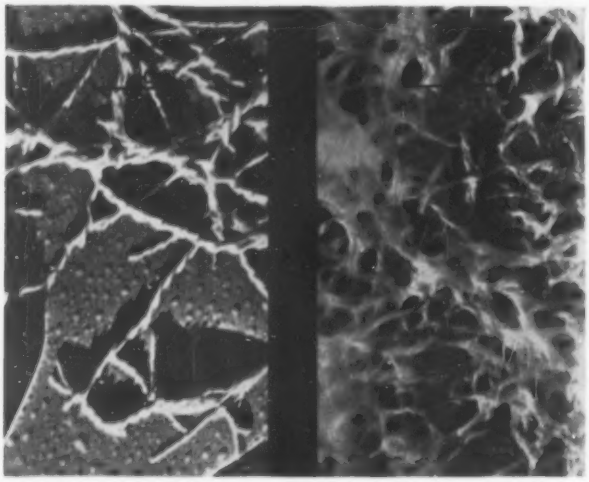

Figure 5—Li-6 Grease. *Left*—Suspension of cetane-extracted grease. *Right*—Section of cetane-extracted grease. Chromium-shadowed.

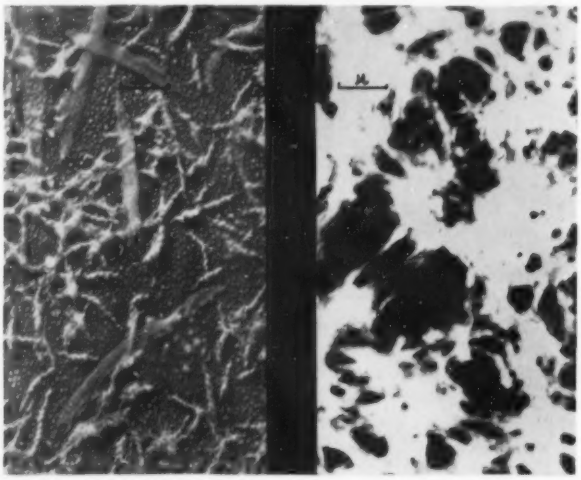

Figure 6—Ca-6 Grease. *Left*—Suspension. *Right*—Section of cetane-extracted grease. Chromium shadowed.

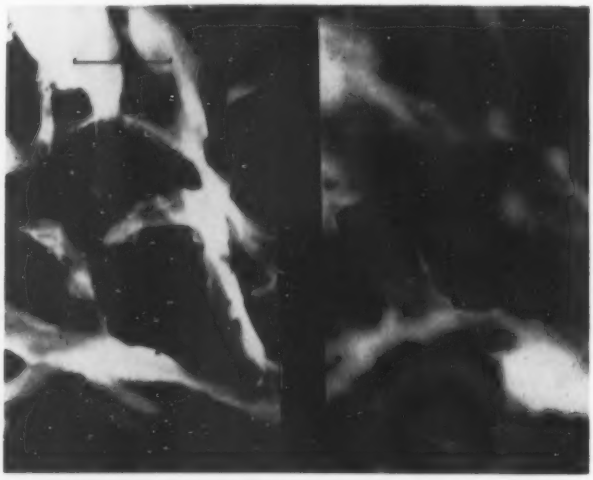

Figure 7—Na-2 Grease. *Left*—Smear. Gold-shadowed. *Right*—Section of cetane-extracted grease. Unshadowed.

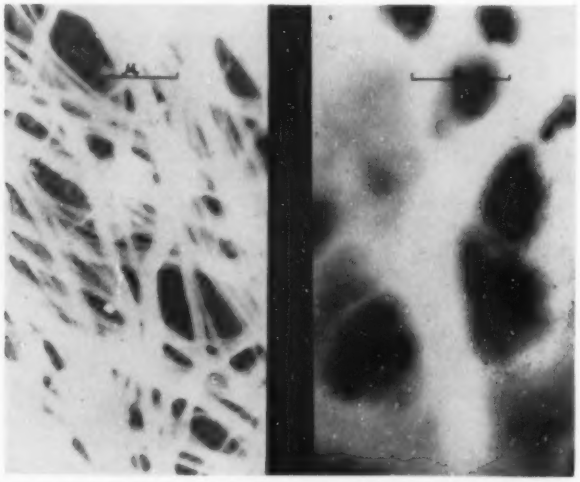

Figure 8—Ba-3 Grease. *Left*—Suspension. *Right*—Section of cetane-extracted grease. Gold-shadowed.

TABLE 2

Results of Orientation Analysis of Grease Al-3*

	F/k	$F(0)/E$
Grease Al-3	†	†
Extracted soap Al-3	2.1	1.0
Fused soap Al-3	2.7	1.0

* 11% aluminum soap of mixed fatty acids, 10% unsaturated, in a base oil of 1200 SSU at 100°F.

† The grease showed no detectable long spacing. Peaks for the soaps showed great broadening, presumably due to very small particle size of the crystallites.

TABLE 3

Results of Orientation Analysis of Grease Li-6*

ϕ	*Observed Values of* $F(\phi)/k$		
	Grease	*Extracted Soap*	*Fused Soap*
−30	—	1.7	3.9
−20	7.7	2.1	4.9
−10	6.1	2.9	4.1
0	8.8	2.6	5.8
+10	5.2	2.9	5.9
+20	4.9	2.6	5.5

*6% lithium 12-hydroxystearate in a 56 V.I. solvent-refined base oil.

Detailed discussion of these results is reserved for joint consideration with the results of the electron microscopy. However, it is interesting to make a preliminary note of the very great differences among the five greases. No departure from random packing occurs for A1-3. For Ca-3 the soap particles in the grease are oriented by shearing, but the curve is lower and flatter than for the extracted soap. For Li-2 the soap particles are relatively highly oriented so far as lying flat on the surface is concerned (pronounced maximum at $\phi=0$) but the mean intensity in the grease is below that for the extracted soap. For Na-2, and even more markedly for Li-6, the observed orientation is not random, but neither is it a smooth function of ϕ, suggesting the existence of homogeneously oriented regions of sufficient spatial extent for the X-ray experiment to show the fluctuations from one region to another rather than yielding a statistical average.

Electron Microscopy

Specimens were prepared for electron microscopy in a number of different ways and many fields were examined for each specimen in order to obtain as nearly objective evidence as is possible with this type of observation.

In one set of experiments the original grease was diluted with hexane and a drop of the suspension placed on a collodion-covered surface of a 200-mesh copper screen and viewed after evaporation of the solvent. This procedure enables evaluation of the size, shape, and morphological characteristics of individual soap particles except insofar as the solvent itself may exert a flocculating or deflocculating effect.

In a third set of experiments, the original oil base was replaced by cetane by allowing grease blocks 1 x 0.25 x 0.25 cm. to stand in cetane for periods up to four weeks, replacing the cetane at intervals. The blocks retained their original dimensions (very nearly). Work of Browning[1] and of Peterson and Bondi[3] suggests that the grease structure is not greatly disturbed in this kind of procedure. The blocks were then frozen and sliced with a microtome modified as described previously,[5] to obtain sections ca, 0.1μ thick. Cetane was removed by evacuation at room temperature.

Another method of preparation was to smear a very small amount of the grease, or the cetane-extracted grease, between two glass slides, one of them having a collodion-covered surface. The collodion film, together with the smeared sample, was floated off on water, and was picked up by a copper gauze carrying a number of the 200 mesh copper screens.

Distortion of the grease structure during slicing manifests itself by the characteristic gathering up of some areas of a section to yield a wrinkled appearance. Little evidence of stretching was found and it appears reasonable to select the uniform thin areas as representative of the undistorted structure. Figure 3, showing portions of a section of a barium grease and of a suspension of the same grease, indicates that when the solvent suspension technique does not distort the original grease particles, and when particles as such are present in the original grease, some objects of the same morphological characteristics can be seen in specimens prepared by either technique.

Experimental results are presented in the form of photographs in Figures 4-8, and are discussed individually in conjunction with the results of orientation analysis.

Discussion of Results

Grease Al-3 (11% aluminum di-soap of mixed fatty acids, 10% unsaturates).* Figure 4 shows that sections and suspensions alike show amorphous masses of virtually unresolved tiny particles. X-ray diffraction lines corresponding to an $00\bar{1}$ spacing would not be found in the grease. The powdered extracted soap did not assume non-random orientation on compaction, but the peaks did show broadening due to small particle size. Numerical size estimates under the experimental conditions used are unreliable, but it is doubtful that the size exceeds about 100 Å in any dimension. The conclusion thus is that large scale oriented soap structures are not built up in this type of grease.

Grease Li-6 (6% lithium 12-hydroxy stearate). Figure 5 shows electron micrographs of suspensions and sections of this grease. The section shows many lath or fiber-like particles which are joined or at least superposed at length intervals of 0.5 to 1μ in such a way as to yield a pronounced network structure. Some of this structure has been preserved even in the suspension, but the freed particles are apparently twisted up into a rope-like form with strands much longer than any having individual existence in the section. Such a twisting up means that dependence of the intensity of the $00\bar{1}$ diffraction peaks on the tip of the surface (ϕ) should be small,

* All of the grease samples used in this work were from the same group, and carry the same designations as those used for differential thermal analysis and X-ray studies previously reported.[5]

since the same number of loops of the twist face in any direction. Data of Table 3 bear this out, the mean intensity (2.5 arbitrary units for the extracted soap) being only slightly less than the maximum (2.9). However, the most striking thing about the orientation data is the high intensity in the grease as compared with the soap, and the lack of homogeneous dependence of the intensity on the tipping angle. A possible interpretation is that the structure is built so as to hold the flat surface of the ribbon-like crystals parallel to each other and that fairly large blocks of this structure orient as units, undergoing deformations of the type postulated in the articulated structure model proposed earlier.[7]

Grease Li-2, for which electron micrographs are not available, also appears on the basis of orientation results to have a high degree of structure which holds the fibers flat rather than twisted but restricts the capacity of individuals to set themselves parallel to flow lines in the grease. Thus the mean intensity for the grease (curve 4 of Fig. 2) is lower than for the extracted soap (curve 2), but the particles in the extracted soap have become twisted so that the mean orientation around the fiber axis is uniform. The fused soap shows this same type of randomness, but a slightly lower intensity, probably due to smaller length/width ratio.

Grease Ca-6 (16.5% calcium tallow soap, and very similar to Ca-3 for which orientation analysis was carried out). Figure 6 shows that a considerable degree of coherent structure exists in this grease, but as soon as this structure is disrupted by suspending solvent the constitutent particles aggregate to rope-like structures many times longer and thicker than the fine fibrils seen throughout the section. The coherent structure, though of smaller mesh than for grease Li-6, seems rather less tenacious in view of the behavior of the suspension. Again this conclusion is borne out by the results of orientation analysis. The structure is weak enough for shear to produce some orientation in the grease itself, but the released particles after extraction are longer in relation to their width, yielding a higher intensity (curve 2 on Fig. 2), and also more twisted (less sharp dependence of intensity than ϕ, curve 1 of Fig. 2). That such asymmetric particles require the freedom of solution in oil to grow is suggested by the low intensity and lack of orientation in the soap powdered after heating to 160°, at which temperature it is in a fluid mesomorphic state which yields a glassy solid on cooling.

Grease Na-2 (16% soap of mixed fatty acids, 10% unsaturates). Figure 7 shows that for this grease there is much less tendency for individual elongated ribbons to twist together into rope-like aggregates when released from the grease structure by solvent dilution. In all sections examined so far, the soap structure, though far from a purely random piling of ultimate particles, is not very clearly resolved.

When subjected to orientation analysis, neither the grease nor the soap extracted from it show a marked regular dependence of the intensity of the 001 peaks on the angle of tip of the surface. In the extracted soap the particles appear to be disposed in random orientation about their long axes but in the grease the same kind of fluctuation is observed as for the lithium greases. A possible interpretation is that the individual fibers cohere at contact points to form an articulated deformable structure differing from that postulated for the lithium greases in tensile strength (smaller for the sodium grease) and in a smaller tendency for mutual parallelism of the ribbon surfaces.

An interesting observation, not clearly significant for interpretation of the grease structure, is that in this case the fused quenched soap, after powdering, contains much more highly orientable particles than either the grease or the extracted soap.

Grease Ba-3 (barium tallow soap stabilized with low molecular weight barium salts, largely acetates). Figure 8 shows that in this grease, the primary constitutents are elongated fiber bundles which are very flexible and tangled up in each other without clear evidence of cohesion at contacts. Sections show matted, broad bands of these fiber bundles of such great density that it is difficult to determine whether or not an integrated structure exists. Orientation studies have not yet been conducted on this grease.

Conclusion

The greases examined appear to vary widely from dispersions of particles too fine to resolve in the electron microscope to gross entanglements of tremendously elongated thread-like fibers to coherent networks of particles with a varying tenacity of cohesion. The way is now open for systematic study of the extent to which the structure for a single soap can be altered by preparative conditions, and what relation this structure may have to macroscopic grease properties.

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DISCUSSION

Presented by R. S. BARNETT, The Texas Company
Beacon, New York

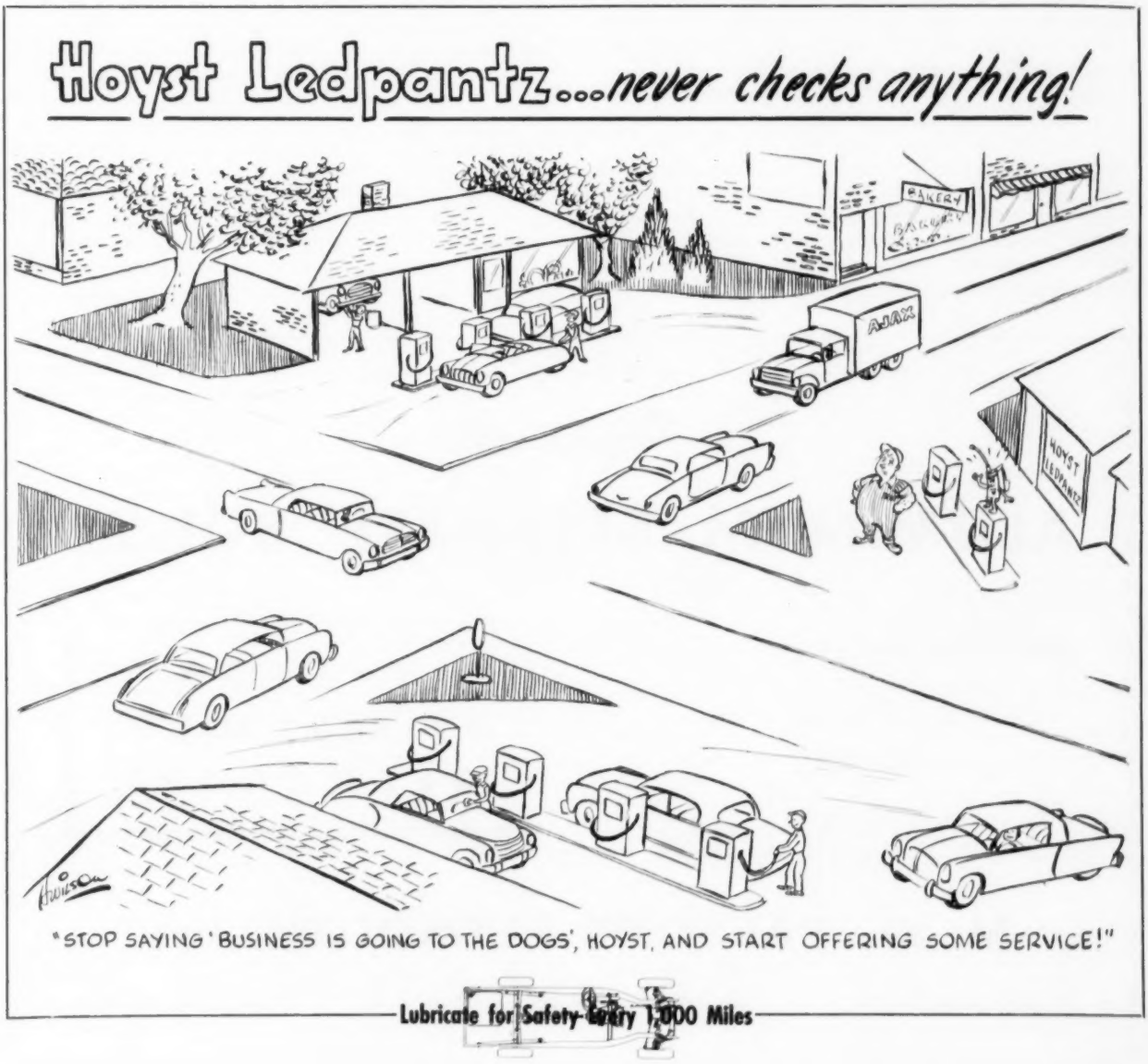
Mrs. Elersich and co-workers should be complimented for their pioneering work on the over-all structure of lubricating greases, and upon the stimulating concepts brought forth. The use of x-ray diffraction analysis to indicate the degree of orientation of the soap crystallites in greases, considered together with the electron micrographs of the sectioned structures, is a promising approach toward solving the problems of grease structure. The concept of the freed soap fibers twisting into rope-like form after cetane extraction and suspension, rather than existing in this form in the grease, appears novel and interesting (Grease Li-6, and Fig. 5).

The short time available for the review of this paper forbids detailed comment. However, the following points suggest themselves:

1. How repeatable are the results of both the X-ray analyses (Tables I, II and III and Figure 2) and the electron micrographs on successive sample preparations?

2. Is Grease Ca-3 a water-stabilized calcium soap grease? If so, the soap crystallites may have been changed by dehydration by solvent extraction at 70°C. in separating the soap for X-ray work. Fusing the soap would certainly dehydrate it.

3. The preparation of samples for electron micrographs contrasts a suspension technique (using hexane dilution of the grease followed by evaporation of the solvent) with a sectioning technique performed on frozen cubes in which the oil had been replaced by cetane and the cetane evacuated. Yet micrograph captions of certain suspensions state that cetane extractions of varying lengths were carried out, presumably prior to suspension. How was this done and why was it necessary?


Hoyst Ledpantz...never checks anything!
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"STOP SAYING 'BUSINESS IS GOING TO THE DOGS', HOYST, AND START OFFERING SOME SERVICE!"
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4. Beacon Laboratories physicists comment as follows:

a. Was the X-ray diffraction procedure used identical to that described in Reference (5) of the bibliography?

b. Desire details of how cetane is evacuated in preparation of sectioned cubes for electron micrographs.

c. Suggest stereo-photographs of sections in order to establish more firmly the dimensions of the meshes shown, and to clarify the appearance of the interconnected fibers by lessening superimposed shadows.

DISCUSSION

Presented by L. C. BRUNSTRUM, Standard Oil Company (Indiana) Whiting, Indiana

At annual meetings of the past five years, predictions of grease structure have been made from solvent studies, flow birefringence, electron microscopy, rheology, and X-ray diffraction. The present paper adds another technique—ultrathin-sectioning electron microscopy. In the first of three discussions, it may be appropriate to briefly review some of the previous conclusions.

In 1949, Browning mentioned the "particulate nature" of grease and concluded, from solvent replacement of the oil, that orientation exists along the borders of blocks of soap-oil gels but not in normal commercial greases. This was not the first mention of soap particles in grease, this phenomenon having been discussed earlier by Farrington and by Bondi. Nor was it the last; Marjorie Vold began her 1952 paper with the words, "Now that it seems well established that the primary structure is a mesh of crystalline particles . . ." Apparently the experts agree that the soap in grease consists of particles.

In 1951, Brown mentioned that flow orients grease structure and supported his views with a movie showing birefringence. He also suggested that, unlike colloids, greases tend to remain oriented. As in the case of the particle studies, this paper was not alone: Gallay and Puddington had discussed orientation previously; Hotten and Eyring have done so subsequently. Apparently the experts also agree that flow tends to orient the particles. The present X-ray work seems to confirm this point of view.

At the 1952 meeting, Brunstrum mentioned that orientation depends upon the flow pattern and that a significant portion of the force causing flow goes into orientation of the thickener particles. At the same meeting, Marjorie Vold reported four patterns of X-ray scattering from a single grease sample after the grease was made to flow in four ways. Apparently we may also conclude that orientation remains for a long if not indefinite period after flow ceases. For these reasons, we should answer the question, "What is the structure of a sample of grease?" with another question: "What was done with the grease last?"

It seems there is still some doubt as to just what is being oriented by flow. Perhaps an extension of the sectioning technique described by Mrs. Elersich will lead to more visual evidence of whether it is discrete particles, a tangled mesh of fibres, a honeycomb, or some combination of these. If so, we will be greatly indebted to this pioneering effort on ultrathin sectioning of lubricating grease.

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Patents and Developments

Greases Stabilized with Sterols and Selenium Compounds

Greases have been prepared containing selenium compounds as oxidation inhibitors. However, their presence is claimed not to be satisfactorily effective in the case of certain grease compositions, particularly those for high temperature service.

In Patent 2,676,149 issued to Shell Development Company, a synergistic cooperation is noted in this respect with minor amounts of polycyclic alcohols and aliphatic selenium or tellurium compounds. The specific improvement involves the discovery that high temperature greases, made with a mixture of aliphatic diesters and high boiling petroleum lubricants gelled with sodium soaps of aliphatic acids having at least 20 carbon atoms and containing metallic salts of aromatic acids, respond particularly well to the presence of 0.25-5% of wool grease alcohols and dilauryl selenide.

A particular example claimed is a mixture of aliphatic diester (such as bis (dodecyl sebacate)), or a polyorganosiloxane, and a petroleum lubricating oil having a viscosity of 1500-3500 SUS at 100° F and containing less than about 10% by weight of aromatic hydrocarbons, 2-25% of sodium soaps of beeswax acids and minor amounts, less than 5% by weight each, of cholesterol, dilauryl selenide and sodium benzoate. Other additives which may be included may be zinc dibutyl dithiocarbonate, reaction product of turpentine and P_2S_5, phenyl-alpha-napthylamine, etc. Bright stock is the preferred lubricating oil to be used.

Soaps as Lubricating Agents

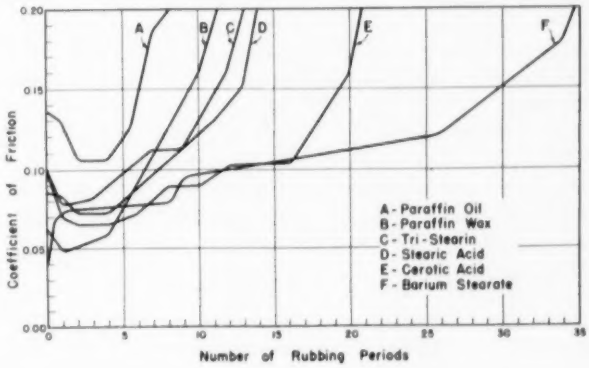
One recently issued patent, while not directly concerned with lubricating greases, does present data on metal soaps which should be of value to the grease maker. This patent, No. 2,673,818, issued to Compagnie Francaise de Raffinage of Paris, points out that surprising resistance to abrasion can be imparted to metals by rubbing their surfaces with certain metal soaps. In the lubrication of fine instruments, as well as camera shutters, etc., oil is claimed to be unsuitable for the reason that it creeps out of the bearing and eventually leaves it dry. In the Epilame process disclosed by Wisner, this difficulty was claimed to have been suppressed to a degree by first treating the bearing surface with a solution of stearic acid prior to application of oil lubricant.

The present development is claimed to be a decided improvement over the Wisner process. Here, the metal surfaces are rubbed with a selected metal soap to provide a tenacious thin lubricating film giving an unusually low coefficient of friction. The accompanying figure presents graphically the coefficients of friction obtained when polished steel surfaces coated with thin films of various materials are rubbed dry over extended periods of time. It is seen that barium stearate is decidedly superior to the next best material (cerotic acid), which still is considerably better than the next best material (stearic acid).

Table I shows a comparison of the effectiveness of the various metal stearates in retaining a low coefficient of friction. The stearates of barium, lead and zinc are the best of the series tested. The soap is applied to the surfaces by mere rubbing of the dry powdered soap with a cloth or sheet of paper.

TABLE I

Dry Rubbed Metal Stearate	*Coefficient of Friction*
Aluminum	greater than 0.200
Barium	0.048
Copper	0.071
Ferric	0.074
Beryllium	0.010
Manganese	0.071
Lead	0.062
Vanadium	0.077
Zinc	0.055



1954

NLGI Annual Meeting
San Francisco
October 25-27

1954

After THE SALE

Walter H. White
Esso Standard Oil Company

"The methods used and the degree of care necessary in storing and handling greases have been developed the hard way, by experience."

Biography

Walter H. White graduated in mechanical engineering from Cornell University in 1930. After a student engineering course with the Standard Oil Company of New Jersey and three years with the Research Division of the Standard Oil Development Company, Mr. White joined the Sales Engineering Division of the Standard Oil Company of New Jersey (now Esso Standard Oil Company). Since that time Mr. White has worked on fuels, lubricating oils and greases used in the automotive, industrial, public utilities and railroad fields. During World War II he served in the Field Service Division of Army Ordnance in similar work. At present he is head of the General Industry Section of Esso's Sales Engineering Division.

After the Sale

In order for grease lubricants to perform as intended they must reach the machinery parts to be lubricated in their original condition as manufactured. Preservation of original quality and usefulness until delivered to users is a basic and constant effort on the part of grease suppliers. The methods used and the degree of care necessary in storing and handling greases have been developed the hard way, by experience. They are adhered to as standard practice by the grease manufacturer because he has learned that this is the only way to insure delivery of proper product to his customers. Users, on the other hand, have often not had the benefit of this experience and may therefore profit by this review of the precautions and methods which have been found necessary for the proper care and handling of greases.

Having received the grease, the first problem is that of proper storage. Before all else, the by-word must be cleanliness. Dirt has no place in a grease or any other kind of lubricant.

It is always best to have a room or "oil house" for the storage of greases and other lubricants. This should be located close to where the lubricants will be used but not so close as to constitute a fire hazard or to expose the lubricants to an unnecessary amount of traffic and the possibility of contamination that goes with it. In many cases, a separate building makes an ideal storage house, although if the plant is extremely large, several such buildings may be necessary to reduce the amount of travel.

Of course, if a storage facility of this kind is to provide the sort of protection required, it must fill certain requirements. Obviously, it should provide protection from the weather but what may not always be realized is that some reasonable temperature range should be maintained. This may involve the installation of ventilation equipment to control maximum temperatures and heating equipment to prevent low temperatures.

If greases are held at elevated temperatures for extended periods of time they may, in many cases, deteriorate to the point where they are useless. This effect would be most important in connection with the storage of the more common lime soap types of chassis grease and cup grease which tend to become rancid often in as short a time as six months. Another factor in the case of conventional lime soap greases is the driving off of the small

percentage of water which is used in their manufacture as a coupling agent between oil and soap. If this water is lost there is a tendency for the soap and oil to separate, in which case the grease becomes lumpy and unusable. This phenomenon also explains why it is always advisable to keep drums of grease away from the immediate proximity of steam radiators or boilers where temperatures could be elevated to the point where they would drive off moisture and cause grease breakdown.

This tendency for a grease to deteriorate with age points up the desirability of maintaining stock control so that a "first in, first out" system of using grease is followed. Naturally, low temperatures make grease difficult to handle as well as making working conditions so uncomfortable that personnel cannot adhere to the best practices and careless work results.

Since cleanliness is so vital in the proper care and handling of greases, it follows that the storage room or house should be of a construction which can be kept neat and clean, both inside and out. Drip pans or trays should be provided as well as necessary equipment for wiping up spills. Permitting slop-overs to lie unremoved on equipment and floors presents both a safety and fire hazard. Drums neatly racked and kept clean not only preserve their contents but make it easier to select the proper lubricant, thus avoiding the possibility of machine failures due to the application of the wrong grease. If block greases are stored, shelving should be provided so that they can be stored in their original wrappers and boxes with the brand names and grades clearly visible. To avoid contamination from dust and dirt they should be kept in those boxes until the time of use.

Storage facilities must be:

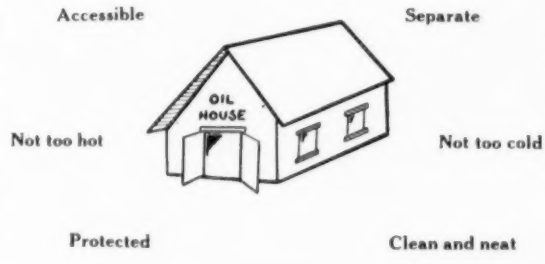


Figure 1

The grease manufacturer has taken particular pains to see that his grease was put in clean drums and pails, that his filling spouts are clean at all times and that proper straining facilities are provided to insure cleanliness. It follows that the user in order to protect his investment not only in grease but in his production equipment should do everything possible to keep the lubricant clean all the way to its final destination, the production machinery. With greases that can be handled in this manner, individual drum pumps should be provided to dispense the grease to the oiler or operator. Preferably grease guns should be filled directly from such drum pumps thus avoiding the possibility of contamination when the grease is exposed to the air during such a transfer. If several different greases must be stored and dispensed each different kind should have its own dispensing pump. Where grease must be removed from drums by hand at various times, several precautions should be observed.

Since the original drum cover is not well suited for repeated removal and replacement, simple covers provided with handles and constructed so that they fit down over the drum top should be provided. Such hoods can be made locally or purchased. Naturally, covers should not be left off of drums but should be immediately replaced after a quantity of grease has been removed. Such procedures are more apt to be followed if made as convenient as possible. If wood paddles are used to transfer grease from a drum, any old available stick should not be used. Paddles finished off so as to be splinter free should be provided.

Strict adherence to these precautions will prevent the entrance of splinters and other dirt to grease guns, lines of centralized greasing systems and bearings. Even the smallest particles of foreign material can interfere with the action of check valves and the small orifices in greasing equipment.

In most instances the last bit of grease in a drum must be removed by hand and transferred to the next drum which is opened. This is very often a prime source of contamination, and particular care should be taken to observe the necessary precautions to prevent contamination in transferring this so-called "heel" of the drum contents.

If it is found necessary to store drums of grease outdoors an open shed should be provided. Failing this racks or dunnage should be provided so that drums do not sit in mud and water and possibly rust through, causing loss of the grease. In unprotected storage of this kind dust and water will inevitably collect on the drum heads unless they are either covered with a tarpaulin or stored in racks on their sides. Storing on the side is preferable because rain cannot collect and collection of dirt is minimized. Such rain and dirt not only increase the danger of contamination but they also obscure the drum markings, sometimes to the extent that it is impossible to determine the kind of grease in the container without analyzing a sample of the contents. This not only causes delay in making the lubricant available for use but also incurs considerable expense for analyses and may result in the wrong grease being applied to critical bearings of expensive production machinery.

As mentioned previously the storeroom or storehouse should be located conveniently from several standpoints. In a large plant, particularly one spread over a considerable area it will probably be necessary to establish two or more storage points. These should be located as closely as possible to the points at which the grease is to be used

and also where they are readily available to the means of transportation by which the grease is delivered by the supplier. Such locations should be readily available to the supplier's delivery vehicle at all times throughout the business day. If possible, definite delivery schedules should be set up so that no time will be lost by either the user's or supplier's personnel in delivering grease and placing it properly in storage.

The size of the storage location will of course depend upon the variety and quantities of greases which are used. "Running out" of various kinds of grease encourages substitution on the part of oilers and operators. Such substitution can endanger the life of machinery, hold up production, increase maintenance cost and otherwise interfere with the smooth operation of a plant.

The use in a plant of the minimum number of greases which will adequately lubricate the machinery will obviously provide economies in the size of storage facilities necessary and will minimize the possibility of applying the wrong lubricant. Over and above these advantages is an additional one to the user from the standpoint of inventory control and the cost savings inherent in handling a minimum number of deliveries, purchase orders, invoices and the cost of other bookkeeping and cost accounting procedures.

Experience has shown that the safest and most economical inventory is one which comprises the least number of different kinds and grades and a planning of quantities such that consolidated orders can be placed at specific intervals, such as monthly, bi-monthly or even tri-monthly. This system encompasses all of the points previously covered, i.e., elimination of "running out," continual use of the proper lubricant in the proper place, and the minimizing of overhead expense such as the handling of purchase orders, invoices, and other bookkeeping.

In recent months the petroleum and container industries have collaborated on a development which is of interest to anyone who must store, handle and dispense greases. This development is the standardization of the new 120 pound grease drum which will take the place of the previous standard 100 pound drum. Figure 2 shows the principal characteristics of this new drum, which from a number of standpoints will improve storage and handling. In the first place, the head is completely removable whereas the previous drum had a permanently fastened head with a hole approximately 6 inches in diameter covered by a bolted and gasketed plate. With the new head a tight fit is maintained with 20 lugs around the top, lugs that are quickly and easily loosened with the tip of a screwdriver. After the cover has been removed, it can be set back on the head of the drum so as to keep undesirable material from falling into it. With the head completely off a follower plate can be inserted in the barrel on top of the grease to make removal of grease easier. This is particularly desirable with the heavier greases. The plate rides on top of the grease, dropping with it as the grease is withdrawn. It keeps weight on the grease so it will feed to the pump and will also prevent grease from sticking to the sides of the barrel. With the older drum such a follower plate could not be used and considerable difficulty was encountered in trying ot pump many greases from the older type drum.

Another advantage of the new drum is that it can be nested on top of another. As Figure 2 shows, the bottom of the barrel is reduced in diameter for this purpose. Note, in this connection that we are speaking of grease drums, not oil drums. There are no bungs in the top of these containers to allow impurities to enter as the result of vertical storage.

These drums are known as 120-pound drums because that is the amount of grease they will hold. Each drum is constructed, as can be seen from Figure 2, with two pressed rolling hoops, which make the container stiffer and easier to roll. This drum will become a standard American container for the transportation and storage of grease.

With the grease stored in a centrally located point and with the facilities previously discussed the final phase of handling is that of moving it to the machinery and bearings which are to be lubricated.

Unless the storage point is so close to the machines that a grease gun can be taken and filled directly at the storage point it is usually necessary to provide some means of transporting the greases from storage to the point of application. Figure 3 shows a typical well designed grease dolly. It is apparent that it can easily be

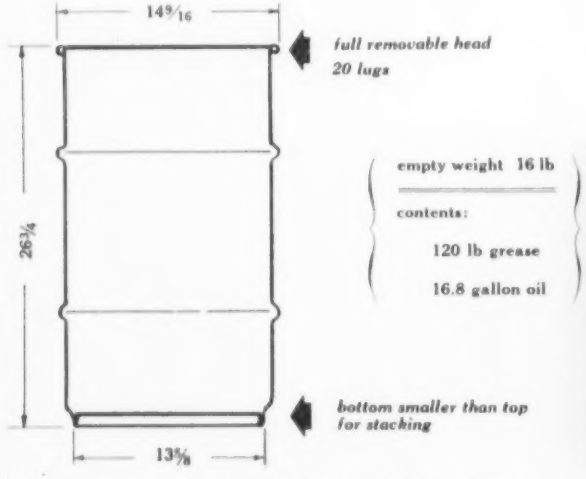


Figure 2—New American standard 120 pound grease gun.

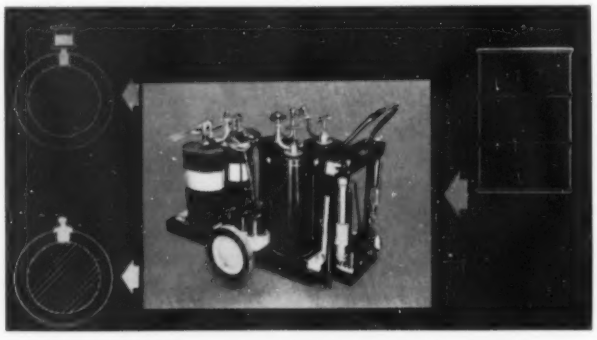


Figure 3—Typical lubrication cart.

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pushed in and out along corridors and between machines. This comprises the neatest, simplest way of tranferring lubricant from the drum in which it is shipped to the bearing or gear box in which it will eventually be used.

Note the convenient arrangement. Volume-type grease guns in the front are balanced by transfer pumps for oil in the rear. Alongside the handle are two hand grease guns and in between are several spout-type oil cans. Thirteen different lubricants can be dispensed from this cart alone. Each of the individual lubricant dispensers is filled in the grease room and transported without possibility of contamination directly to the fitting or housing in which it is to be used.

Such dollies are available or can be built to suit any specific purpose. In many of them the original 35-pound pail or 120-pound drum may be placed directly on the dolly thus obviating the necessity for transferring grease from the drum in the storage room to the container on the dolly. Various adaptations of this kind can be made to suit any particular set of operating conditions.

One other scheme is often used to assist in the assurance that the clean undeteriorated grease delivered by the suppliers is in turn delivered in the most efficient manner possible to the correct mechanisms. This is a coding system sometimes carried out with symbols and in other instances using colors. In this system a symbol or a particular color identifies the lubricant throughout its entire route in the plant even to the fittings to which it is applied. As long as the code is followed, it is impossible to apply the wrong lubricant. As far as the operator is concerned, the lubricant originates in a drum marked with a given symbol or color. This lubricant is transferred to a pour can or a grease gun both of which are marked with the same symbol. No opportunity for error here. From the gun or can the lubricant is applied directly to the bearings which are also labelled with the same code symbol. With a system like this, errors can often be minimized almost to the vanishing point.

Figure 4—Containers stacked haphazardly against steam pipes—an example of how lubricants should not be stored.

As indicated before other coding systems will work just as well although symbols or colors are used in our description to identify the source, the dispenser and the point of application, letters, numbers or names would also serve satisfactorily. Whatever code is chosen, though, should be simple and easily understood. Such a system needs good housekeeping, besides, because if the machines or dispensers get dirty it may be hard or even impossible to read the code. In the case of using colors, it would also be necessary to see that no lubrication personnel or operators are color blind.

To summarize then, the grease user in order to obtain the maximum beneficial service from the greases in which he has invested his money should follow these practices:

A. Maintain separate storage facilities. Don't let greases lie around in the dusty or busy areas of the plant where they will become contaminated, and where they, in turn, may soil other supplies and equipment.

B. Keep containers closed. Dirt is one of the worst lubricants in the world. Keep it out of lubricants and bearings.

C. Use proper dispensing equipment. Wherever possible have separate dispensers for each different type of grease.

D. Stress cleanliness. Above all stress cleanliness. It's the No. 1 approach to long and efficient machinery life.

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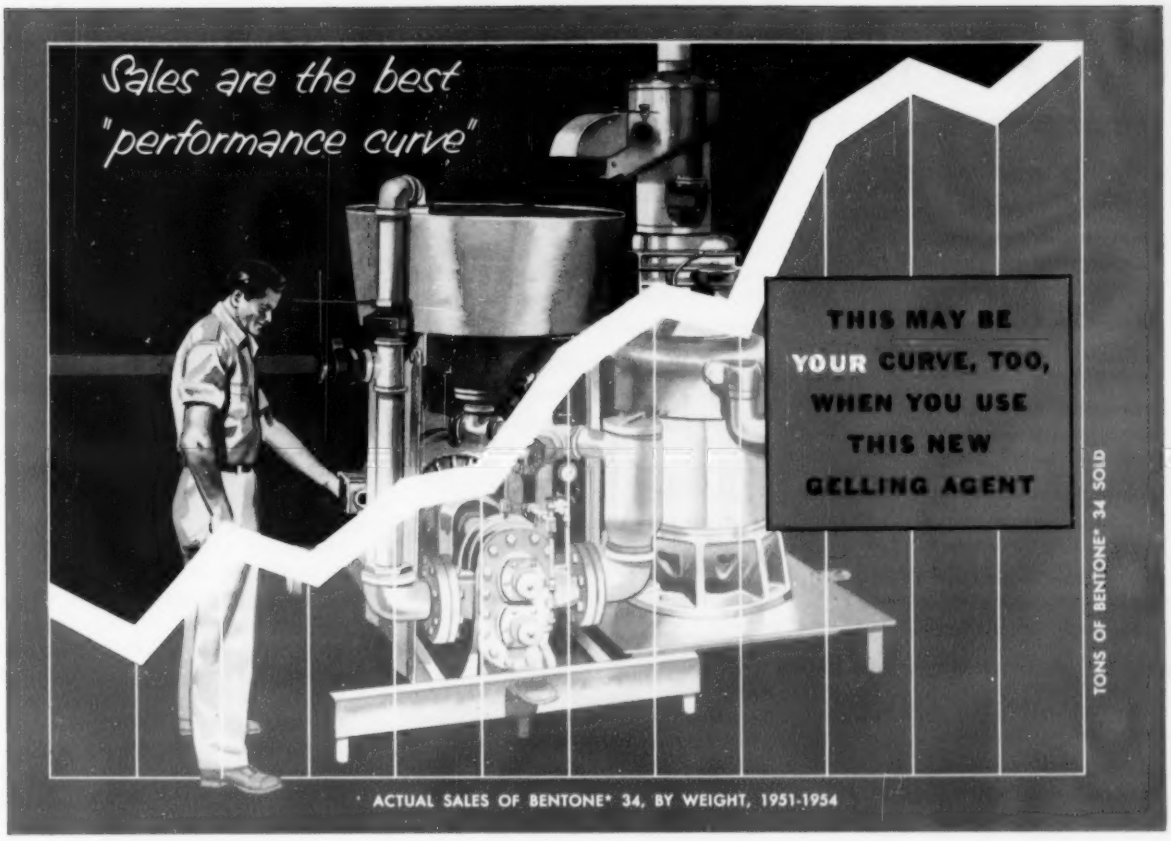
GREASE STORAGE AND HANDLING

1. Covers for drums and pails.
2. Proper transfer equipment.
3. Facilities for different size containers.
4. Facilities to clean up spills.
5. Facilities to clean tools and equipment.

Using the care and providing the facilities previously described might appear costly and difficult of accomplishment. However, experience has shown that the precautions and methods described are practical. When it is considered that all of the machinery in a plant, in other words the revenue producing equipment of the business, depends for its continued operation upon the lubrication of and elimination of wear in its bearings and other moving parts, the effort becomes worthwhile. One breakdown of a critical machine can stop production, and in one short shutdown can be lost considerably more than the money which might have been spent in properly caring for and handling the lubricants applied to that machine. The demands of a machine for proper lubricants are constant and insatiable. Human failure to supply the right kind of lubricant, in the correct quantity and in proper condition will not be forgiven by any machine. It will simply evidence its disapproval of such human failure by quitting or breaking down.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Auguste Gaulin invented the Homogenizer, which is actually a high pressure dispersion unit, totally unsimilar to any equipment manufactured up to that time. This unit utilized a high pressure pump and a controlled restricted orifice. The word HOMOGENIZER was coined by Gaulin and utilized by him thereafter.

In the early 1900's an American company manufactured the Gaulin Homogenizer in the United States, primarily for the dairy industry.

In 1920, the company was taken over by John Colony, who, by intensive promotion, engineering, and sales ability, developed and improved the Gaulin Homogenizer so that it was widely accepted throughout the dairy industry for the homogenization of milk and the preparation of ice cream mixes. From the middle 30's on there was a rapid conversion in the dairy industry to the homogenization of milk. There were also various uses of the Homogenizer made in the industrial field.

In the early 1940's, D. G. Colony, son of John Colony, assumed the presidency of the company upon the death of his father. During this period intense thought was given to the use of the machine in its many industrial applications. After the war ended in 1945, it was possible to devote the attention of the company to these industrial applications, both in redesigning the equipment to make it suitable for such uses and also finding the markets and developing processes where the equipment could be successfully utilized.

The Manton-Gaulin Homogenizer is used extensively in the fields of food, cosmetics and pharmaceutics. It also has been used in the dispersion of pigment and in the preparation of wax emulsions, polishes, insecticides, waterproofing compounds, rubber products, warp size compound for the textile industry, liquid starch for home use, molasses for animal feed, vitamin emulsions, wire drawing compounds, wax emulsions, wax-tall oil emulsions for paper manufacture, monomer emulsions in the manufacture of synthetic rubber and resins, and resin emulsions for paper coating. In the grease field it is used primarily for the finishing of soap greases and the manufacture of solid additive type greases.

Manton-Gaulin is the largest manufacturer of Homogenizers, Colloid Mills, and Stainless Steel High Pressure Pumps in the world.

NLGI Company Representative

George W. Eldridge, is the industrial sales manager of the company. He is a graduate of Trinity School, class of 1928, New York City, and a graduate of Brown University, class of 1932, with a degree of B.S. in civil engineering.

George W. Eldridge

From 1932 to 1935, he worked for the State of Rhode Island and the United States Government. From 1935 to 1942, he was employed by the Turner Construction Company of New York City, on work in the building construction field.

In 1942, he was commissioned in the U. S. Naval Reserve, the civil engineering corps, and was assigned to the Seabees, serving in the South Pacific for two and a half years. Returning to this country, he was assigned to the Bureau of Yards and Docks, in Washington, D. C., for another year, as Lt. Commander CEC.

He returned to civilian life in October of 1945, becoming sales manager

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of the Unisorb Division of the Felters Company, Boston, Massachusetts, manufacturers of Unisorb, a vibration machine mount. He was head of the division until September, 1951, when he became the industrial sales manager of the Manton-Gaulin Manufacturing Company, Inc., of Everett, Massachusetts.

NLGI Technical Committee Member

L. H. REES

L. H. Rees received his undergraduate training in chemistry at Boston University, graduating in the class of 1936. From 1936 until 1948, he was employed by the Esselen Research Corporation of Boston, working as a consultant on the staff for research products for industry.

In 1948, he joined the staff of the Manton-Gaulin Manufacturing Company as technical director. He is a member of the American Chemical Society.

He has had a considerable part in the many developments of the Gaulin Homogenizer, from the machine utilized in the dairy industry to its counterpart in the industrial world. Mr. Rees—in the name of the Manton-Gaulin Manufacturing Company—secured a patent for the preparation of warp size, utilizing the Homogenizer. This patent covered the conversion by mechanical means or homogenization of starch in other industries.

He was also instrumental in the development of the unit for the grease industry: specifically, he developed the high impact seat, which is a portion of the homogenizing valve assembly. In addition, he has developed other means of processing material in many different fields of industry.

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Kyodo Yushi Company, Ltd. Joins

NLGI Welcomes Kyodo Yushi Company, Ltd. As an Active Member

NLGI Company Representative

SOSHIRO KOFUNE

Mr. Soshiro Kofune, born in Yokosuka City, Japan, graduated from Tokyo University of Commerce in 1926, and entered the Nippon Hatsudokiyu Co., Ltd. (lubricating oil manufacturer) and was promoted to chief of the sales department of its Tokyo Branch in 1933.

In 1936 he established the Kofune Oil Co. and opened its head office in Tokyo with several branches in China to carry on sales and exports of petroleum products.

In 1944 he established the Kofune Trading Co., Ltd. for the purpose of carrying on an export business, and became its president.

After the war, in 1946 he reorganized the Kofune Trading Co., Ltd. into the Kyodo Yushi Co., Ltd. and started anew as a grease and cutting oil manufacturer.

Thereafter, he has been an adviser of the General Railway Board of the Transportation Ministry; president of the Asahi Koki Co., Ltd. (shovel manufacturer); president of the Sagami Shoji Co., Ltd. (petroleum dealer); auditor of the Kamata Oil Co., Ltd. (petroleum dealer); and adviser of the Japan Association of Railway Industries.

At present, he is devoting himself to the Kyodo Yushi Co., Ltd. and the Asahi Koki Co., Ltd., and at the same time is a member of the Commercial and Industrial Society of Japan and also active in several of the petroleum societies in Japan.

NLGI Technical Committee Member

HACHIRO KAGEYAMA

Mr. Hachiro Kageyama, born in Hamamatsu City, Japan, after graduating in chemistry from the Nihon University, Tokyo, has been studying, since 1946, petroleum technology and carrying on research work at the Institute of Science and Technology of Tokyo University.

In 1951 he joined the laboratory of the Kyodo Yushi Co., Ltd. as chief chemist.

Kyodo First in Japan

The Kofune Trading Co., Ltd. was established in February of 1944 for the purpose of carrying on exports of petroleum products to the Far East among the firms of the Kofune Oil Co., which has been managed as private concerns by Mr. Soshiro Kofune, active president of the Kyodo Yushi Co., Ltd.

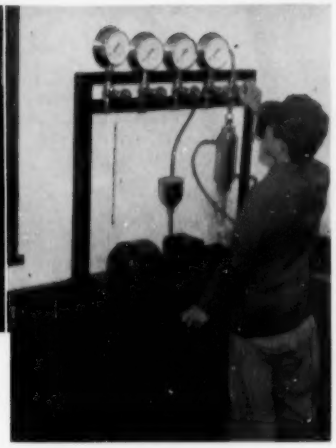
In August 1946, the Kofune Trading Co. changed the name into Kyodo Yushi Co., Ltd. and built a factory at Tsujido, Kanagawa Pref., Japan, to manufacture various kinds of lubricating grease and cutting oil, and in 1950 it constructed another factory in Kobe City, Japan, where it is manufacturing the neck grease of iron roll mills and insoluble cutting oils.

At present it ranks first in the country in production and sale of grease, for it produces and sells 15 per cent of the total domestic amount.

Increase in the laboratory staff and the hiring of several professors, experts in their field, as technical advisers, has enabled the laboratory to devise new and improved methods of production and research. Kyodo Yushi's laboratory progress has been notable in the field of grease manufacturing in Japan.

Moreover 1,500 copies of the "Kyodo Grease Times" are being published and distributed quarterly since last year as a technical service to all consumers and dealers. The publication of a magazine on grease is something new in Japan.

★



Shown here are pictures made in the laboratory of the Kyodo Yushi Company

A microscope that enables oil men to study objects 10,000 times smaller than a human hair is in use by an oil company in the United States. Direct magnification with a special electron microscope is 60,000 times, and by adding a photographic process, can be boosted to 150,000 times. Oil men, who search for new methods as diligently as they search for oil, use the instrument to study the structure of greases, carbon blacks, petroleum chemicals, and similar products.

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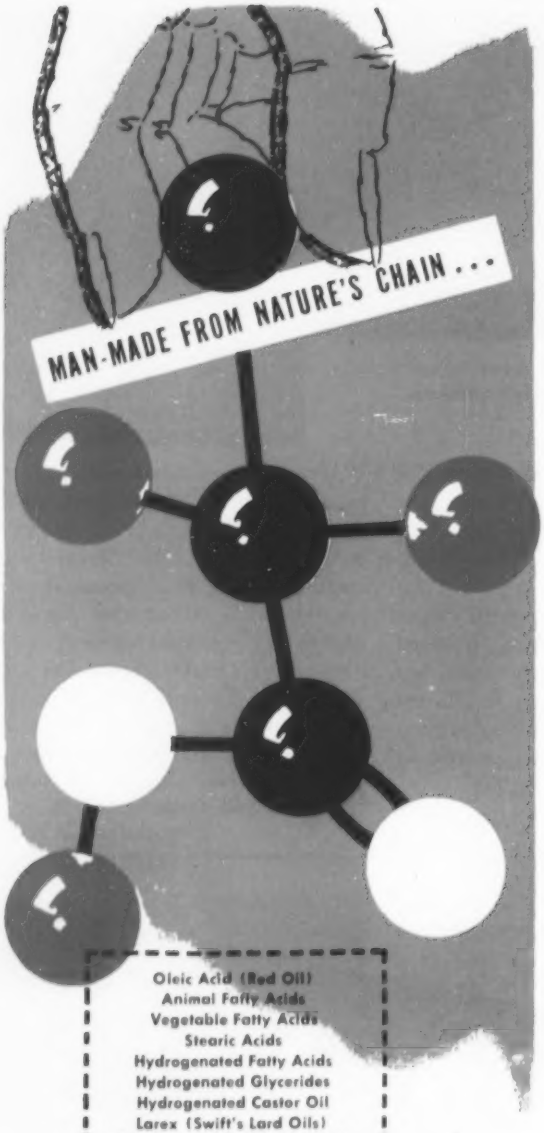

SWIFT'S FATTY ACIDS

. . . FOR LIGHTER, MORE UNIFORM LUBRICANTS

Unique *selective* extraction process helps assure desired penetration, better color and heat stability.

We've come a long way from the days when a little animal fat and lime soap made a good axle grease. Today's modern machinery has created problems requiring more effective lubricants. The use of animal fatty acids has played a valuable role in the development of better yields and more uniform lubricants for uses that were unforeseen a few years ago.

At Swift & Company, we are already looking *beyond* present day successes with a group of tallow fatty acids, oleic acids, vegetable fatty acids and hydrogenated products . . . products that do nature *one* better in being literally man-made from nature's chain.

Through a unique high temperature solvent process Swift & Company is able to *selectively* extract the products with which we work. In this manner free fatty acids, color bodies and other factors, are controlled to a degree heretofore impractical. The result is a combination of a wide variety of highly stable fatty acids that can be relied upon in use . . . dependably specified for your most exacting lubricating soap needs.

So, if you're looking for the means for high yield, uniform product and outstanding color and heat stability —see Swift's fatty acids first and remember . . .

Oleic Acid (Red Oil)
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PEOPLE in the Industry

Shell Announces Personnel Changes

The appointment of Paul E. Hurley as manager of Shell Oil Company's Houston refinery has been announced by F. S. Clulow, vice president in charge of manufacturing.

Hurley, who has been manager of the company's refinery at Norco, Louisiana, since 1945, will succeed M. P. L. Love, soon to begin a special assignment abroad.

The new appointment is the latest in a long series of advances during Hurley's 34 years with Shell. He started to work for the company as a gauger at the Wood River, Illinois, refinery in 1920, and rose through the ranks to become superintendent of the Norco refinery in 1938. He was acting superintendent of the Houston refinery from 1942 to 1945, when he returned to Norco to become manager.

Roy W. Faulk, superintendent at the Norco refinery for the last year and a half, will succeed Hurley as manager there. Faulk is a veteran of 25 years with Shell. Before becoming Norco superintendent he was manager of the manufacturing department of Shell Oil Company of Canada.

Mancel E. Overman has been promoted to the managership of Shell Oil Company's crude oil department. He succeeds Arthur P. Ruether, who has retired after 34 years of service with the company.

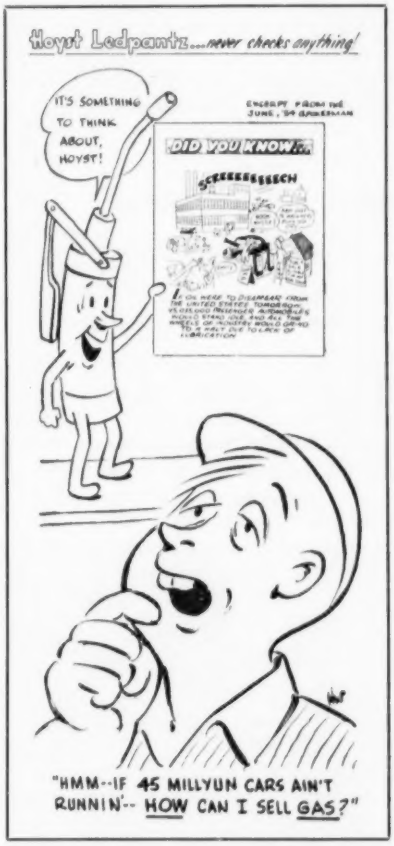
Mr. Overman, who attended the University of Nebraska, joined Shell in 1926 and was appointed assistant manager of the crude oil department in 1947.

A native of St. Louis, Missouri, Mr. Ruether began his employment there in 1920 and served as a sales representative and later as manager of the firm's sales department. He assumed the managership of the crude oil department in 1931 and since then has been responsible for maintaining adequate supplies of crude oil for the company.

Dr. Noyes D. Smith, director of Shell Development Company's exploration and production research Laboratory in Houston, Texas, has been elected a vice president of the company.

Dr. Smith was graduated from the University of Texas and obtained his Ph.D. in physics from Harvard University before joining Shell as a seismologist in 1935. During World War II he was on leave of absence with the Naval Ordnance Laboratory in Washington, D. C.

Upon his return to Shell in 1946, he was appointed manager of the laboratory's physical department. The following year he was made manager of the administrative department, and in 1951 he became research manager of the technical department. He was promoted to the directorship last year.


Hoyt Ledpantz...never checks anything!
IT'S SOMETHING TO THINK ABOUT, HOYST!
DID YOU KNOW?...
SCCCCCCCCCCH
"HMM--IF 45 MILLYUN CARS AIN'T RUNNIN'-- HOW CAN I SELL GAS?"

An exchange of territories among Shell Oil Company's general sales managers, effective August 1, has been announced by J. G. Jordan, marketing vice president.

P. C. Thomas, general sales manager in charge of East Coast divisions will take over supervision of the Midwest area; Selwyn Eddy, Midwest general sales manager, will go to the West Coast; and J. L. Wadlow, West Coast general sales manager, will move to the East Coast.

Mr. Thomas joined Shell in his home city of St. Louis as a salesman in 1932. Three years later he became district manager at Houston, Texas, and in 1936 returned to St. Louis as sales manager. He became division manager in 1940 and general sales manager at San Francisco in 1948. He was appointed his present post in 1951.

Mr. Eddy was born at Bay City, Michigan. He joined Shell as a service station salesman in San Francisco in 1925 and later served in various sales positions in California. Subsequently he served as division manager in Detroit and New York. He was appointed to his present post in 1951.

Mr. Wadlow, who was born at Elvins, Missouri, joined Shell as a service station salesman at Granite City, Illinois. After serving in various marketing positions in the Midwest, he became district manager at Jacksonville, Florida, in 1931 and the following year was appointed division manager. Subsequently, he served as division manager at Indianapolis, and at Atlanta. He was appointed to his present post in 1951.

William Ewart Elected Vice President of Gredag, Inc.

William Ewart, a resident of Niagara Falls, N. Y., was elected Vice President of Gredag, Inc., Niagara Falls, N. Y., at the company's annual meeting of stockholders on July 1.

Mr. Ewart has been in the company employ for thirty-one years. The following were also elected officers: Howard A. Acheson, President; John C. Sprague, Secretary and Treasurer; and Mrs. Hazel M. Ewart, Assistant Secretary and Assistant Treasurer. Directors chosen were: H. A. Acheson, M. W. Reynolds, and J. C. Sprague. Mr. Daniel W. Streeter of Buffalo, N. Y., resigned as President.

Gredag, Inc., a subsidiary of Acheson Industries, Inc., was founded in 1910 by the late Dr. Edward Goodrich Acheson.

U. S. Steel Appointments

The appointment of L. J. Rohl to the newly created position of chief metallurgical engineer of United States Steel Corporation was announced recently by Harvey B. Jordan, executive vice president of operations.

At the same time it was announced that R. W. Simon has been named to succeed Mr. Rohl as chief metallurgical engineer, operations–steel.

Mr. Rohl joined U. S. Steel at South Works, Chicago, Ill., in 1917. He advanced through the positions of product metallurgist, assistant superintendent of alloy production, assistant superintendent of the production department, and superintendent of production. In 1933, he became assistant to the general superintendent of South Works and later that year he was appointed assistant manager of the Chicago District metallurgical division. In 1943, he was made manager of this division and was promoted to the position of assistant chief metallurgical engineer in 1947. Later that year he was made chief metallurgical engineer, operations–steel.

In 1953, Mr. Rohl spent several months in Europe as a government consultant for the European Steel Industry. He is a member of the American Institute of Mining and Metallurgical Engineers, American Iron and Steel Institute, American Ordnance Association, American Society for Metals, British Iron and Steel Institute, National Security Industrial Association, and the Society of Automotive Engineers.

Mr. Simon joined U. S. Steel in 1927 as a metallurgical assistant at Homestead Works. He served in various metallurgical and administrative capacities at Duquesne and Youngstown Works until he was appointed as a metallurgist to the Pittsburgh general office metallurgical staff in 1935. In 1939, he was made assistant manager of the Pittsburgh District metallurgical division and was appointed manager of the division in 1942. In 1947, he was made assistant chief metallurgical engineer, operations–steel.

He is a member of the American Institute of Mining and Metallurgical Engineers, American Iron and Steel Institute, American Society for Metals, American Society for Testing Materials, Association of Iron and Steel Engineers, and the Engineers Society of Western Pennsylvania.

Will J. Borwick has been appointed manager of the St. Louis district of United States Steel Supply Division of U. S. Steel Corporation, it has been announced by C. W. Lord, vice president of the warehousing division. Borwick succeeds L. F. Niemann, who is retiring after 43 years service.

Borwick was born in Newberg, Ore., Oct. 8, 1912. He joined U. S. Steel Supply in 1948 as a purchasing and stock records supervisor in the Los Angeles warehouse. He was promoted to office manager in 1949 and became assistant district manager in 1951. In 1953 he was advanced to district manager in Portland, Ore., the position he held until his present appointment.

Wedemeyer to Rheem

The election of Lieutenant General Albert C. Wedemeyer (USA, Ret.) as a vice-president and director of Rheem Manufacturing Co. was announced recently by Richard S. Rheem, president, following a special meeting of the board of directors in San Francisco.

Mr. Rheem said that Gen. Wedemeyer will assume his new responsibilities Sept. 1 and will make his headquarters at the company's New York offices.

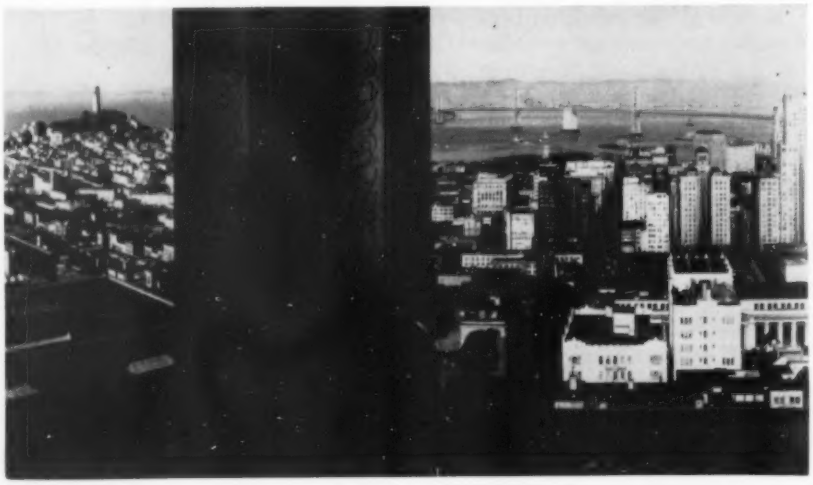
General Wedemeyer has resigned a similar post which he held since 1951 with Avco Manufacturing Corp. He joined Avco shortly after his retirement in 1951 upon completion of 32 years of military service during which time he won recognition as one of the nation's outstanding military strategists.

Horst Joins Foote

William E. Horst recently joined the Foote Mineral Company Research and Development Department as a Metallurgical Engineer. A graduate of the Missouri School of Mines, Horst was with United States Smelting Refining and Mining Company and the United States Army Engineers from 1952 to 1954.

Top of the Mark . . .

One of the most famous landmarks in the country. You may read about it here, but you will have the opportunity of actually seeing it at the NLGI Social Hour, Tuesday, Oct. 26.

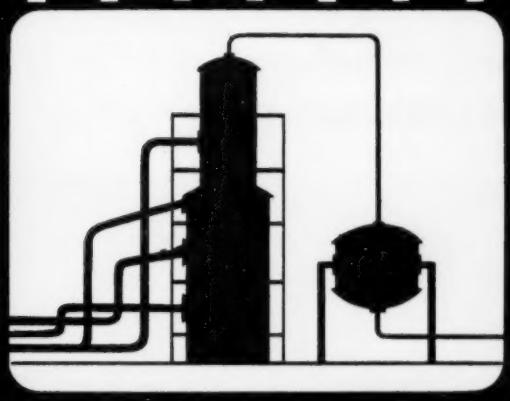


After the Social Hour there is the Annual Banquet to attend. Highlight of past meetings, it will be something to again remember this year.

TO SEE SAN FRANCISCO FROM THE TOP OF THE MARK ATTEND THE ANNUAL MEETING OCTOBER 25-27, 1954

Century Products

for the lubricating grease industry



Have you investigated the outstanding qualities of Cenwax A and Cenwax G in the compounding of lithium greases?

Cenwax A (12-Hydroxystearic Acid) produces grease with exceptional shear stability, good water resistance, and stable greases over wide temperature ranges. Compounding greases at low temperatures as well as quick cooling are desirable features.

Cenwax G (Hydrogenated Castor Oil Glyceride) An excellent glyceride of 12-Hydroxystearic acid where the use of a glyceride is preferred because of processing conditions.

Write for specifications and samples

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Century Stearic Acid Products, Inc.

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
PLANT: DOVER, OHIO
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General Mills Fatty Acids Cut Gum Formation ☆☆☆☆☆ Trace-Metal Contaminants Removed ☆☆☆☆☆ Composition is uniform

Greases for heavy transport equipment must lubricate under all conditions, in all types of weather, without gumming up. Oxidative stability is an important consideration for such lubricants.

Suppose you went to the doctor . . . feeling like a left-over hamburger . . . and he said, "Here, take this medicine. It may not help you much, but it's cheap." Sounds strange, doesn't it. But maybe you do almost the same thing when you use fats not prescribed to cure your grease production ills.

Grease Oxidation, for instance, is a common problem which is frequently attributed to an excessive quantity of polyunsaturated fatty acids—fast oxidizing, gum-formers such as linoleic and linolenic acids. Recognition of this problem, causes General Mills to select and process raw materials in such a manner that the Aliphats (fatty acids) contain a minimum amount of oxidizable impurities.

The Aliphats are also processed so that minimum amounts of trace-metal contaminants such as copper and nickel, remain.

It has also been found that for a given iodine value, fatty acids make greases which oxidize slower than those made from tallow. Conversely you can use cheaper fatty acids of higher iodine value to get grease with equal oxygen stability.

That's why many grease makers use all or part fatty acids in compounding oxygen-stable greases. They keep cost down, but get a substantially more stable lubricant.

☆☆☆☆☆

Uniformity and Light Color make General Mills Aliphat (fatty acid) 26-C a favorite with lime grease makers. Its high stearic acid content, compared to mixed animal fats, boosts the yield of calcium greases. This whole distilled grade of animal fatty acids contains all the acids that occur in natural tallow, but the glycerine and mucilaginous impurities have been removed.

Then, there are other fatty acids designed for your specific needs. There are fractionally distilled animal fatty acids (Aliphats 26-A and 26-B); fractionally distilled palmitic-stearic fatty acids (Aliphats 6-B and 6-C); a fractionally distilled mixed vegetable fatty acid (Aliphat 46-C); a distilled cottonseed fatty acid (Aliphat 33-L); and many more. General Mills also supplies hydrogenated tallow glycerides for grease manufacturing.

☆☆☆☆☆

Perhaps Best Of All the prices of General Mills fatty acids are attractively low—especially when you consider higher yields and productivity of plant equipment and manpower.

You can use less fat by substituting more reactive General Mills fatty acids, either completely or in combination with whole fats. You can adjust the fatty acids to give you proper balance for a superior product and yield.

In short, use fatty acids that have been processed to remove diluents, impurities and other sources of instability; uniform acids that can be mixed in ratios that offer the most benefit for you. That means General Mills Aliphats.

For technical information on General Mills grease-making fatty acids, write today on your letterhead, or mail the coupon below.

SEND THIS COUPON

PROGRESS THRU RESEARCH

☆☆☆☆☆ **General Mills** **CHEMICAL DIVISION**
KANKAKEE, ILLINOIS

Please send me technical information for the General Mills grease making fatty acids checked below.

Aliphats (fatty acids):

- ☐ 6-B
- ☐ 6-C
- ☐ 26-A
- ☐ 26-B
- ☐ 26-C
- ☐ Hydrogenated Tallow Glycerides
- ☐ 33-L
- ☐ 46-C

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Industry NEWS

Brussels to Host International Congress

For the fifth time since 1926, Brussels, Belgium, this fall, will be host to the international congress of the Societe Francaise de Chimie Industrielle of Paris.

The program will feature lectures and meetings of study groups, visits of plants in the principal Belgian industry centers, and formal opening and closing meetings.

The Honorary Presidency has been assumed by Mr. Solvay, and Mr. Boudart, President of the Federation of Chemical Industries of Belgium, presides over the Organizing Committee. C. J. Gullissen, Professor at the Brussels Free University has been appointed President of the Scientific Committee.

New Chek-Chart Tractor Lubrication Guide

Just off the press, Chek-Chart's all-new, Sixth Edition Guide to Approved Lubrication for Tractors presents a new chart format which simplifies, organizes and eases the job of tractor lubrication.

The same elements used in previous charts—diagram drawing, type matter, and arrows—have been skillfully rearranged to achieve a chart which is simple and easy to use either as an on-the-job guide or as an authoritative reference. All directions, part names, locating arrows, lubricant symbols and intervals pertinent to the actual job of lubrication have been grouped to the left of a 40 per cent larger diagram drawing. All reference material and additional service items are grouped in a separate section to the right of the diagram drawing. For farmers who service their own tractors, for oil company men serving farm accounts, the new charts provide an easy, sensible way to thorough, correct lubrication for tractors.

Page size of the new edition has been increased to 8-½ x 11-¾ in. as compared to 7x9 in. in previous editions.

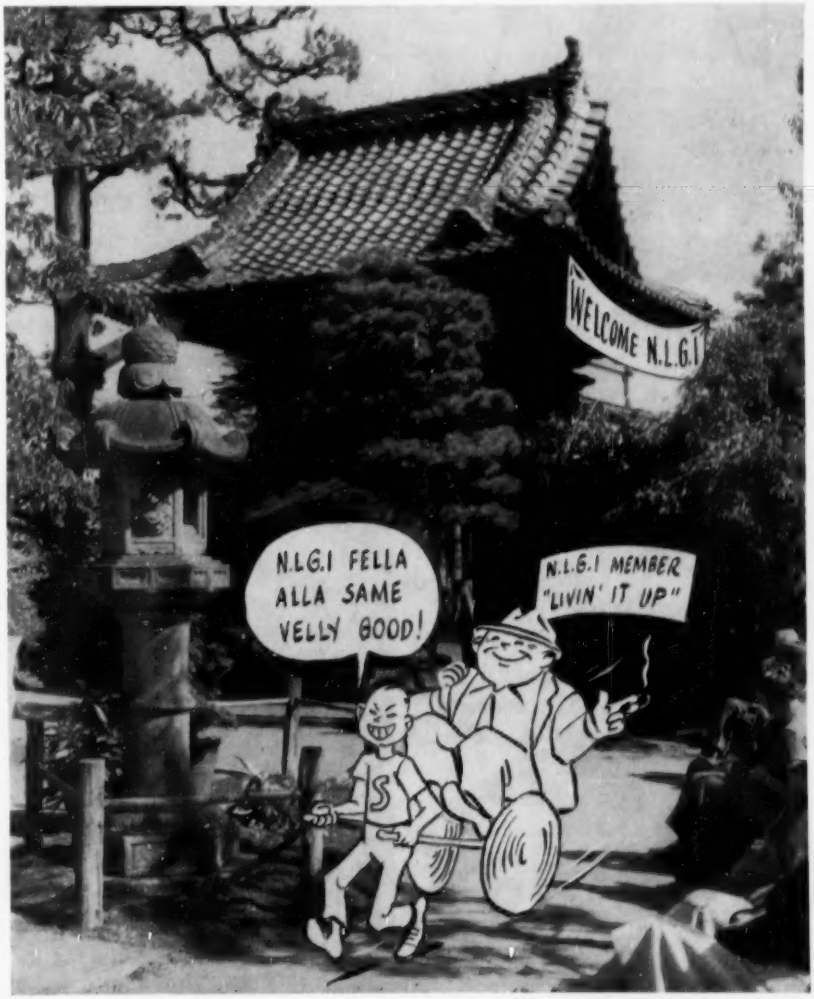
The new guide covers the bulk of the makes and models of farm tractors in use in the United States. All information is up to date through 1954; covers wheel-type and track-laying type tractors. The complete 80-page edition includes a special "Know Your Tractor Chart" page plus a brand new, 5-page section of Service Instructions. Typical procedures include Air Cleaner Service, Crankcase Service, Diesel Fuel Injection Unit Service, Distributor Service, Final Drive Service, Belt Pulley Service and others including Tire Care and Tractor Storage suggestions. The complete edition is ideally suited for tank wagon route men, rural service stations, implement dealer service departments and others. Individual tractor charts, suitable for distribution to farmers, are available from the new edition.

Texas Company Develops Camera Mounting

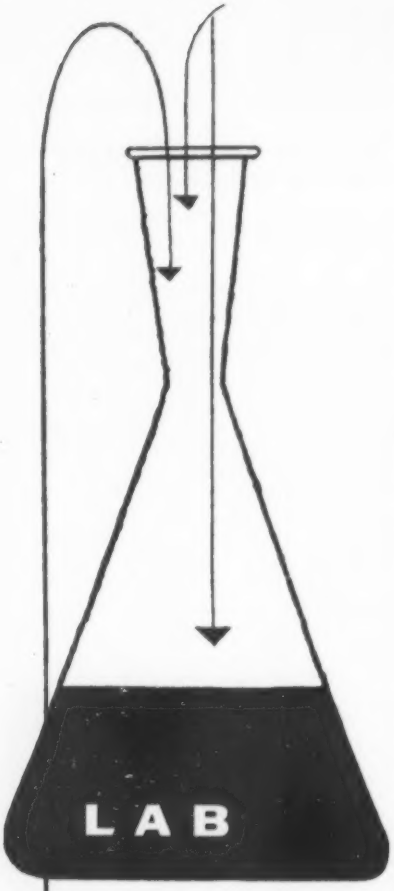
An ingenious mounting which permits a camera to photographically peel off the surface of a piston without optical distortion was used in engine studies carried out at the main research center of The Texas Company recently.

The mounting was developed to overcome inherent optical distortions in a similar rig previously used in petroleum research.

The device works somewhat on the principle of a panoramic camera, which rotates as it scans the subject during an exposure. In this case, how-



THE PLACE—the Japanese tea garden in San Francisco's thousand acre Golden Gate Park. THE TIME—the NLGI Annual Meeting, October 25-27.



—improved

—tested

—quality-controlled

Automotive Lubricants

Greases

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ever, the camera remains stationary and the subject moves. The piston revolves on a platform which travels at right angles to the long axis of the rig. The camera scans the surface of the piston through a narrow vertical slit in the long box. The construction of the rig permits the aperture to travel exactly in step with the revolving piston, thereby cancelling out the motion.

Formerly, optical distortion in the apparatus caused the pictures to come out tapered from the center to the ends. The novel camera rig provides a fast, convenient record for research after an engine has been torn down following a test run. By slightly modifying the motion controls, the internal surfaces of bearing shells also may be photographically unwrapped.

ASTM Dedicates Warwick Memorial Room

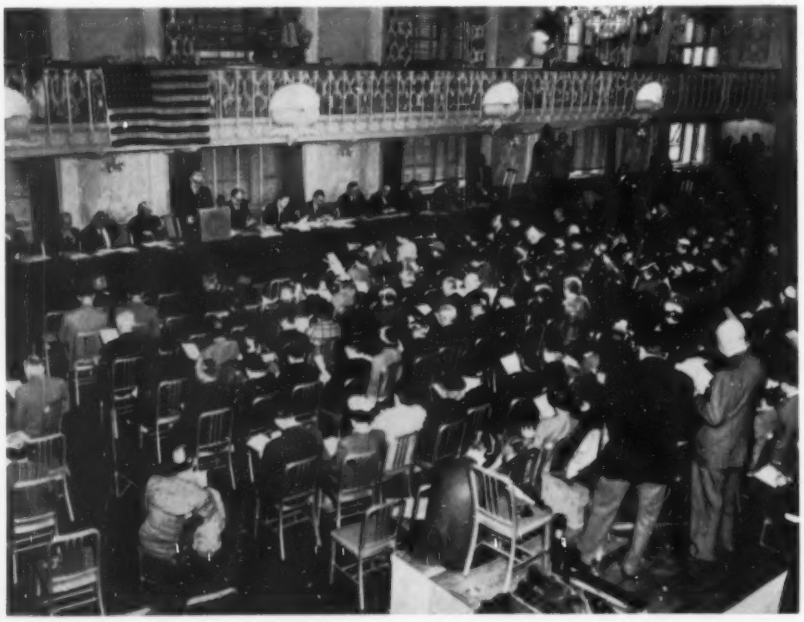
The Warwick Memorial Room in headquarters of the American Society for Testing Materials, Philadelphia, was dedicated during a meeting of the Board of Directors recently. The dedication consisted of the unveiling of an oil painting of C. Laurence Warwick and the mounting of two bronze plaques—the central tablet inscribed "This room is dedicated to the memory of C. Laurence Warwick who served the Society with distinction 1909-1952" and citing positions in which he served the Society.

Mr. Warwick, long-time Executive Secretary of ASTM passed away suddenly on April 23, 1952. As administrative head of the Society since 1919, he had made many notable contributions in the field of standardization and research in materials and was recognized as an outstanding leader in the standardization movement in this country. While he was Instructor and Assistant Professor at the University of Pennsylvania, he also served as Assistant Secretary of ASTM with Edgar Marburg, the Society's founder secretary. In 1919 on the death of Dr. Marburg, he was appointed Secretary-Treasurer and in 1946 became Executive Secretary.

U. S. Steel to Manufacture Plastic Pipe

National Tube Division of United States Steel Corporation has announced that it would begin installation immediately of equipment for the manufacture of plastic pipe.

L. J. Mason, vice president of National Tube, said that the installation would be located at the company's present Gary Works and actual extrusion of pipe would start sometime in September. Mr. Mason announced



Television history was made recently when ABC-TV movie cameras recorded the proceedings of Continental Can Company's annual stockholders' meeting, which took place in the Grand Ballroom of New York's Hotel Biltmore. When the filmed session was shown on a recent telecast of John Daly's "Open Hearing," it marked the first time that the general public was admitted to this phase of American business procedure through their TV sets.

that screw-type extruders would be installed which would manufacture pipe from ½ inch to 6 inches. Several plastic materials will be used, including polyethylene and polyvinyl chloride.

It is expected that the installation will provide employment for about twenty-five people, depending upon the number of shifts operated.

Railroads Report On Petroleum Use

Purchases of petroleum products in 1953 by the nation's Class I railroads totaled nearly $400 million, according to data on railroad expenditures compiled by the Association of American Railroads in Washington, D. C.

The railroads paid out $42 million last year for lubricating oils, greases, boiler compounds and related products.

Altogether, Class I railroads in 1953 spent $1,920 million for the fuel, materials and supplies they used in their daily operations. Of this sum, nearly 27 per cent ($510 million) went for fuel of all kinds.

Railroads last year also originated 45 million tons of petroleum and by-products, according to preliminary statistics compiled by the Interstate Commerce Commission.

These petroleum shipments consisted of more than 12 million tons of fuel and road oils, 11.5 million tons of gasoline, 9.2 million tons of other refined petroleum products, 4.7 million tons of asphalt, 3.9 million tons of lube oils and greases and 3.8 million tons of crude petroleum.

The average distance petroleum shipments move over rails is about 415 miles, the A.A.R. report showed.

American Potash Expanding

American Potash is participating in the development of a large high-grade lithium-beryllium property located in Southern Rhodesia, Africa. The company has the right to handle the sale of all products from this operation and is currently marketing two of the most widely used lithium ores, Lepidolite and Petalite. Discussing the lithium field President Colefax said, "We foresee a tremendous growth in the market for lithium salts in enamel frits, all-weather greases, air conditioning, specialty glass and other industrial uses. We have high hopes for our future in this field."

A company spokesman stated: "What we are doing is moving ahead in an orderly progression from one group of products to another. In focusing our attention on the boron, lithium and bromine fields, we are applying ourselves to products where we have a basic position and in which we see challenging possibilities. We already have a head start with these three chemicals. We have been working with them for years. In short, we feel that we are in a strategic position to integrate our past record in heavy chemicals and our future plans for selected fine chemicals."

The objective of the Study Committee is to determine first if there is need for an Operations and Engineering Committee, and if so, what activities should it undertake to be of service to the marketing segment of the oil business.

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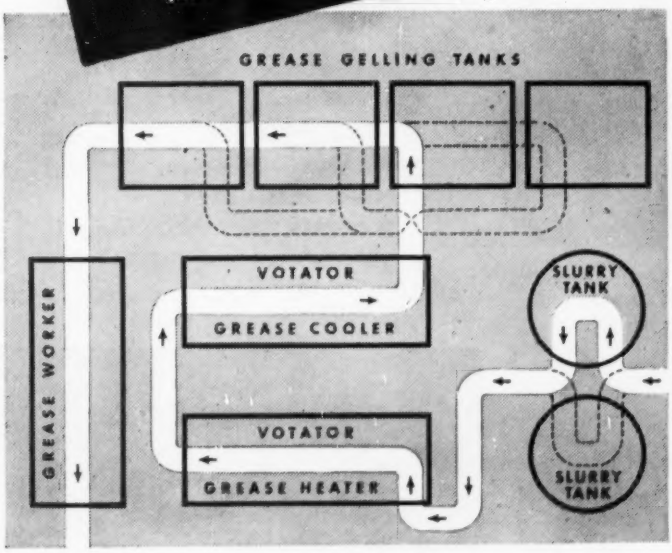
GREASE MAKING APPARATUS

...makes a top quality product at **lower cost!**



VOTATOR* Grease Making Apparatus converts an aluminum or lithium base slurry into smooth, glossy-sheen grease of highest quality . . . on a continuous basis. The result is high volume production coupled with many operating economies such as: pan-cooling is eliminated; less space is required than for batch methods; reworking is eliminated because of close quality control; operator attention is minimized because of closed-system, automatic control.

Write for complete information. The Girdler Co., Votator Division, Louisville 1, Ky.

* VOTATOR—Trade-Mark Reg. U. S. Pat. Off.

the GIRDLER Company
A DIVISION OF NATIONAL CYLINDER GAS COMPANY
VOTATOR DIVISION

Ward Addresses New Orleans Group

In a speech to the Members' Council of the Chamber of Commerce of New Orleans William H. Ward, a vice president of the Du Pont Company, called on industry to "stop trying to influence the nation, and concentrate upon our own immediate communities and publics. They may be more inclined to listen to use and believe us."

The chemical industry cannot do it alone and has no desire to do so, he said. It is not an independent industry that can stand alone, "but rather one which is an integral part of America's vast industrial picture."

The chemical industry is not well known in the sense that such industries as steel and oil are known, he continued. It is "woven into the industrial fabric of the United States more tightly than any other single industry. While it makes many products sold directly to the ultimate consumer, its sales largely consist of chemicals required as raw materials or in the manufacturing processes of other industries," he said, adding that "every industry requires chemicals at some stage in the completion of a finished product."

Even though it is not well known, there are more than 9,000 chemical companies in the nation, he pointed out, noting for example that there are 16 major competitors in plastics, 117 in anti-freezes, and 1,200 in paint, among others.

"Since most chemical products can be made from alternate raw materials and by several different processes, there is keen competition in every line. The chemical manufacturer never knows when the research of a competitor will turn up a better product or one that can be sold at less cost."

"The industry cannot stand still, because in some respects it is like a funnel. Research and innovation, which are the industry's outstanding characteristics, pour in new products and new processes at the top, while chemicals and processes rendered obsolete drain out at the bottom."

"The scientists tell us that the number of new chemicals which can be produced is almost infinite and the research laboratories develop about 10,000 every year," he said. "There is not the slightest doubt that products not yet discovered but which are sure to emerge from research—known products still in the laboratory or semi-works stage—along with those now ready for commercialization, will cause the industry to continue to grow and to contribute even more to the over-all economy."

The chemical industry, by its research work, has had "the practical effect of conserving our supplies of vital raw materials. In part this has been done by the synthesis of natural products or the discovery of alternate sources of supply. In part it has been done by the development of more efficient extraction or utilization processes.

API Publishes New Booklet

A new edition of "Facts About Oil," a handy reference booklet containing up-to-date statistics and other data on the petroleum industry, is now off the press.

Published by the American Petroleum Institute, the booklet has been distributed to newspaper editors, radio

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broadcasters and television commentators by local members of Oil Industry Information Committees all over the country.

Copies of the booklet also are being made available to libraries and other informational sources. Single copies may be obtained gratis by writing to the American Petroleum Institute, 50 West 50th Street, New York 20. Bulk copies are available at $20.00 per hundred.

"Facts About Oil" is a 32-page booklet. Liberally illustrated with photographs and line drawings, it provides up-to-date information and other data on the oil industry in these broad sections: origin, exploration, drilling, production, transportation, refining, supply and demand, marketing, uses and general economics.

A foreword in the booklet notes that "with the vast quantities of petroleum that competing oil companies have found in the past 95 years, man has done more to improve his position in the physical world than in all previous history." The foreword also states:

"Petroleum helped make possible the development of high-speed, long-lasting, and efficient steam engines, internal combustion engines, and other machinery. As a result, our use of mechanical energy has multiplied 250-fold in nine decades. Machines, which depend upon petroleum for all of their lubrication and almost two-thirds of their fuel, now do 96 per cent of the work in this country.

Standard of California Decreases Imports

Standard Oil Company of California will decrease its petroleum imports by 9,600 barrels daily below the levels previously planned for the remainder of 1954, it has been announced by R. G. Follis, chairman of the board of Standard.

He said this will bring the company's total anticipated imports into the United States down to approximately 87,000 barrels daily during the balance of the year. The new reductions all will be made in shipments to the East Coast.

Follis explained this is the latest of several substantial reductions in imports the company has made during recent months.

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Socony's Technical Service Department Analyzes Millionth Sample

Reflecting the growth and increasing complexity of the petroleum industry over four decades, the Technical Service Department of Socony-Vacuum Laboratories in Brooklyn, N. Y., which started in 1914 with a half-dozen men in a single room, recently analyzed its millionth sample. The department now occupies five buildings, employs 221 people, and uses the most modern equipment.

In 1914 the laboratory was the general laboratory of the Standard Oil Company of New York. The Technical Service Department specializes in assisting users of Socony-Vacuum products throughout the world, with primary emphasis on quality control.

Another branch of the laboratories at Paulsboro, N. J., performs most of the basic research and development for the company and a third unit, operated in Dallas by Magnolia Petroleum Company, Socony-Vacuum's Southwest affiliate, concentrates on crude oil exploration and production problems.

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Continental Sends Aid In Flood Disaster

Continental Can Company was among the many local and national sources that came to the aid of disaster victims of the recent Rio Grande flood at Laredo, Texas and into Mexico.

Trucks were assembled at Continental's Houston plant and loaded with several thousand two-gallon and five gallon screw top and open top cans for carrying and storing water and for cooking. In addition, 250,000 Continental hot drink cups and paper plates were sent.

These emergency supplies were expressed to the American Red Cross Disaster Headquarters in Laredo, where they were used to feed the hardest hit flood victims on the Mexican side of the border.

The Red Cross' letter of thanks read:

"We wish to express appreciation to . . . Continental Can Company, for your generous contribution of cans and paper products. The efforts . . . in expediting the delivery of these items during a holiday week end was a wonderful gesture of neighbor helping neighbor."

New Chek-Chart Truck Guide

Three significant improvements mark the new Sixth Edition of Chek-Chart's Approved Lubrication for Trucks with Bus and Coach Recommendations, published recently.

The new edition features a larger page size as compared with previous Truck Lubrication Guides produced by Chek-Chart. The new edition's page size is 8½ x 11¾ in. as compared with the 7 x 9 page size in the preceding Fifth Edition. The larger page size contributes generously to improved readability of the material on each page, since larger type, larger diagrams and larger illustrative drawings are used throughout.

In addition to the larger size, the Sixth Edition incorporates the successful "Work-Saver" chart format on all diagram chart pages. First introduced in Chek-Chart passenger car lubrication guides in 1953, the new format organizes each chart visually in the way that lubrication work is done.

Technical Conference

Plans for the first "Electrical Conference of the Petroleum Industry" was a program featuring leading engineers, scientists and technicians to be held in Tulsa, Oklahoma Sept. 27, 28, and 29 in the Mayo Hotel, have been announced. The three day technical conference is being held under sponsorship of the Petroleum Industry Committee of the American Institute of Electrical Engineers with the Tulsa Section of the Institute acting as host.

Latest developments in the use of electricity and electrical equipment in the petroleum industry will be reported in 19 technical papers to be presented by outstanding engineers in all phases of the petroleum industry. The purpose is to further advance the art of electrical engineering and provide an interchange of electrical technology through a broad industry wide coverage of applications in oil and gas production, refining, transportation and allied petro-chemical fields. The meeting will be open to all interested in the program.

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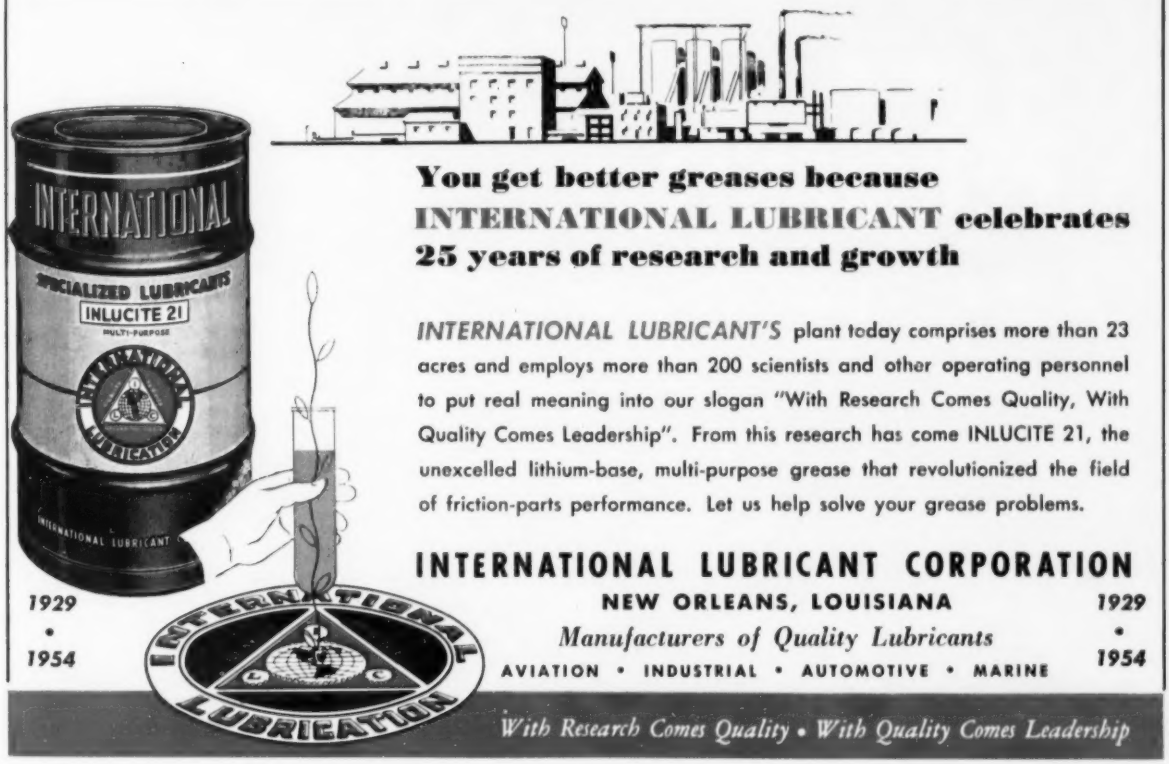

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This means that for most purposes the grease user can stock just one grease, instead of three or four "special" greases for water-resistant, high temperature, low temperature or general applications. Obvious results: lower inventory requirements and lower grease costs—with dependable grease performance! Added benefits are the elimination of possibilities of grease misapplication or delay in lubrication because a special-purpose product is not in stock.

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Monsanto Builds

Construction work has been started on a 400-tons-per-day 100 per cent sulfuric acid unit at Monsanto Chemical Company's William G. Krummrich plant at Monsanto, Ill., it was announced recently by Vice President J. L. Christian, general manager of the company's Inorganic Chemicals Division.

The new unit, which is expected to be in production Jan. 1, 1955, will supplement existing facilities. The unit is known as a Leonard-Monsanto contact sulfuric acid plant.

API Primer

Drilling for oil is not only a tricky business, but the men who do it have a colorful jargon that could easily confuse even the most erudite apprentice.

To help new employees, the Division of Production of the American Petroleum Institute has come up with a primer.

The 74-page book contains information about oil and gas production. Written in simple, nontechnical language, it enables the reader to obtain an elementary understanding of the day-to-day workings of oil and gas fields.

Many illustrations and line-drawings are used to amplify the text.

In addition to the straight material, the "Primer of Oil and Gas Production" includes a glossary which should be more than helpful to beginners in learning oil field slang.

A foreword in the book states:

"No attempt has been made to go into detail. Because of the wide variations in specific methods and techniques used in many different fields throughout the country, problems have been dealt with in a general manner. The problems used, the explanations given, and the pictures and drawings shown are merely illustrative and in no sense are to be considered as API recommendations, or as being the only way in which the objective could be accomplished."

Single-copy price of the book is $1.50, but special discounts are allowed on bulk orders. Requests for the primer must be placed with the API's Division of Production, 300 Corrigan Tower Building, Dallas 1, Texas.

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FUTURE MEETINGS of the Industry

AUGUST, 1954

16-18 Society of Automotive Engineers (national West Coast meeting), Los Angeles, Calif.

SEPTEMBER, 1954

7-9 Assn. Of Desk & Derrick Clubs of North America (3rd annual convention), Banff Springs Hotel, Banff, Alta.

8-10 American Society of Mechanical Engineers (fall meeting), Schroeder Hotel, Milwaukee, Wis.

8-10 Oil Industry Information Committee, Conrad Hilton Hotel, Chicago, Ill.

12-14 Empire State Petroleum Assn., Hotel Syracuse, Syracuse, N.Y.

12-16 Society of Automotive Engineers (national tractor meeting), Schroeder Hotel, Milwaukee, Wis.

12-16 American Inst. of Chemical Engineers, Colorado Hotel, Glenwood Springs, Colo.

12-17 American Chemical Society, New York, N. Y.

13-14 Packaging Institute (petroleum packaging committee), Philadelphia, Pa.

15-17 National Petroleum Assn. (52nd annual meeting), Traymore Hotel, Atlantic City, N. J.

15-17 American Petroleum Institute Lubrication Committee, Traymore Hotel, Atlantic City, N. J.

16-17 Mid-Continent Oil and Gas Assn. (annual meeting), Roosevelt Hotel, New Orleans, La.

22-23 Ohio Petroleum Marketers Association (fall conference and golf tournament), Hollenden Hotel and Westwood Country Club, Cleveland, Ohio.

23-24 Western Petroleum Refiners Assn. (regional meeting), Henning Hotel, Casper, Wyo.

26-28 Pennsylvania Petroleum Assn., Inc., Pocono Manor Inn, Pocono Manor, Penna.

27-28 Independent Oil Compounders Association (7th annual meeting), Sheraton Hotel, Chicago, Illinois.

OCTOBER, 1954

3-7 ASTM Committee D-2 on Petroleum Products and Lubricants, Sheraton Park Hotel, Washington, D. C.

4-6 Texas Mid-Continent Oil and Gas Assn. (annual meeting), San Antonio, Texas.

4-6 Petroleum Electric Power Association (26th anniversary meeting), Jung Hotel, New Orleans, La.

4-9 Society of Automotive Engineers (national aeronautic meeting), aircraft engineering display, and aircraft production forum, Hotel Statler, Los Angeles, Calif.

7-8 American Institute of Mining and Metallurgical Engineers (Pacific Petroleum Chapter), Biltmore Hotel, Los Angeles, Calif.

10-12 National Assn. of Oil Equipment Jobbers (4th annual meeting), Congress Hotel, Chicago, Ill.

10-12 Empire State Petroleum Association, Whiteface Inn., Whiteface, N. Y.

12-15 National Chemical Exposition (8th meeting), Coliseum, Chicago, Ill.

13-15 National Industrial Conference Board (annual meeting on atomic energy), Hotel Commodore, New York, N. Y.

17-20 American Institute of Mining and Metallurgical Engineers (fall meeting, petroleum division), Plaza Hotel, San Antonio, Texas.

Week of
Oct. 18 Society of Automotive Engineers (national transportation meeting), Boston, Mass.

20-21 Nebraska Petroleum Marketers Assn. (annual convention), Paxton Hotel, Omaha, Neb.

21-22 Western Petroleum Refiners Assn. (Garrett Hotel), El Dorado, Ark.

24-26 Independent Petroleum Association of America, Mayo Hotel, Tulsa, Okla.

25-27 NLGI ANNUAL MEETING, MARK HOPKINS HOTEL, SAN FRANCISCO, CALIF.

25-29 American Institute of Electrical Engineers (fall general meeting), Chicago, Ill.

26-27 Society of Automotive Engineers, national diesel engine meeting, Hotel Statler, Cleveland, Ohio.

27-29 American Institute of Electrical Engineers (Conference for Petroleum Industry), Mayo Hotel, Tulsa, Okla.

27-30 American Society of Mechanical Engineers (annual engineering conference), Statler Hotel, Los Angeles, Calif.

28-29 American Petroleum Institute (Executive Committee of the Board of Directors), The Greenbriers, White Sulphur Springs, W. Va.

NOVEMBER, 1954

4-5 Society of Automotive Engineers (national fuels and lubricants meeting), Mayo Hotel, Tulsa, Okla.

8-11 American Petroleum Institute (34th annual meeting), Conrad Hilton Hotel and Palmer House, Chicago, Ill.

15-17 American Petroleum Credit Association (annual conference), Muehlebach Hotel, Kansas City, Mo.

15-17 American Standards Association (annual meeting), Roosevelt Hotel, New York, N. Y.

15-17 National Conference on Standards (5th conference), Roosevelt Hotel, New York, N. Y.

28 to Dec. 3 American Socy. of Mechanical Engineers, Statler Hotel, New York, N. Y.

29-30 Packaging Institute (Petroleum Packaging Committee), New York, N. Y.

DECEMBER, 1954

2-7 National Exposition of Power and Mechanical Engineering, Commercial Museum, Philadelphia, Penna.

3-4 Interstate Oil Compact Commission, Drake Hotel, Chicago, Ill.

5-8 American Society of Agricultural Engineers (winter meeting), Edgewater Beach Hotel, Chicago, Ill.

8-10 Oil Industry Information Committee, Waldorf-Astoria, New York, N. Y.

12-15 American Inst. of Chemical Engineers (annual meeting), Statler Hotel, New York, N. Y.

27-30 American Association for the Advancement of Science, University of California, Berkeley, Calif.

JANUARY, 1955

10-14 Society of Automotive Engineers (golden anniversary annual meeting), The Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Michigan

FEBRUARY, 1955

13-18 ASTM Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston, Texas.

MARCH, 1955

15-17 Ohio Petroleum Marketers Association (spring convention and trade exposition), Deshler-Hilton Hotel, Columbus, Ohio.

MAY, 1955

23-25 American Petroleum Institute (Division of Marketing, mid-year meeting), Chase and Park Plaza Hotels, St. Louis, Mo.

JUNE, 1955

6-15 Fourth World Petroleum Congress, Rome, Italy.

NOVEMBER, 1955

14-17 American Petroleum Institute (35th annual meeting), San Francisco. Calif.

OCTOBER, 1955

23-25 National Assn. of Oil Equipment Jobbers (4th annual meeting), Hotel President, Kansas City, Mo.

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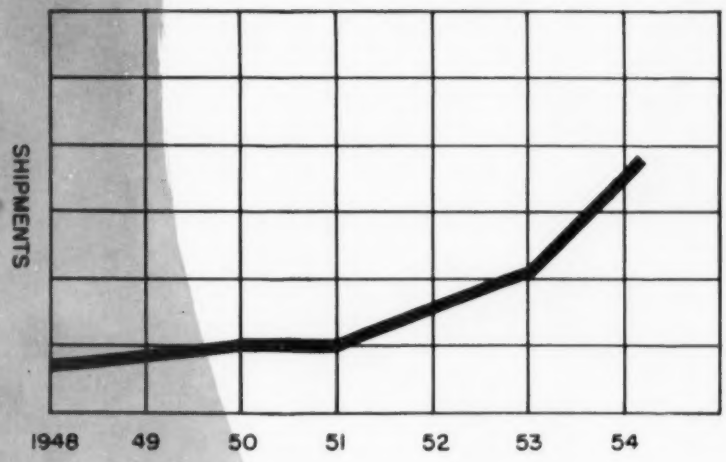

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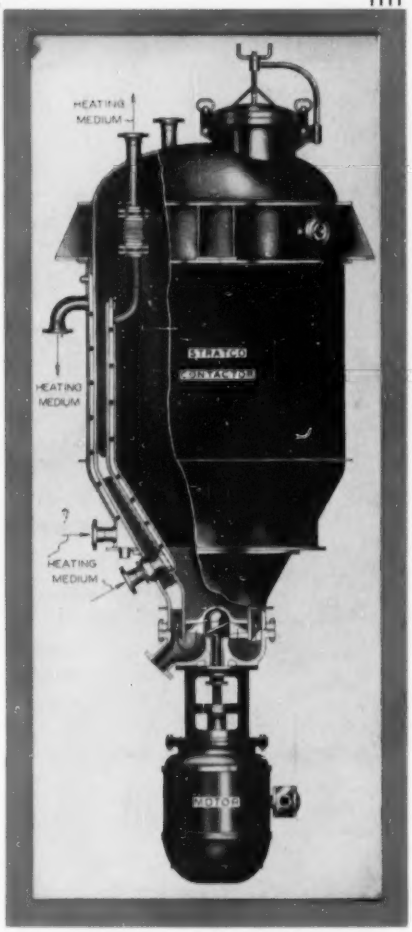

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